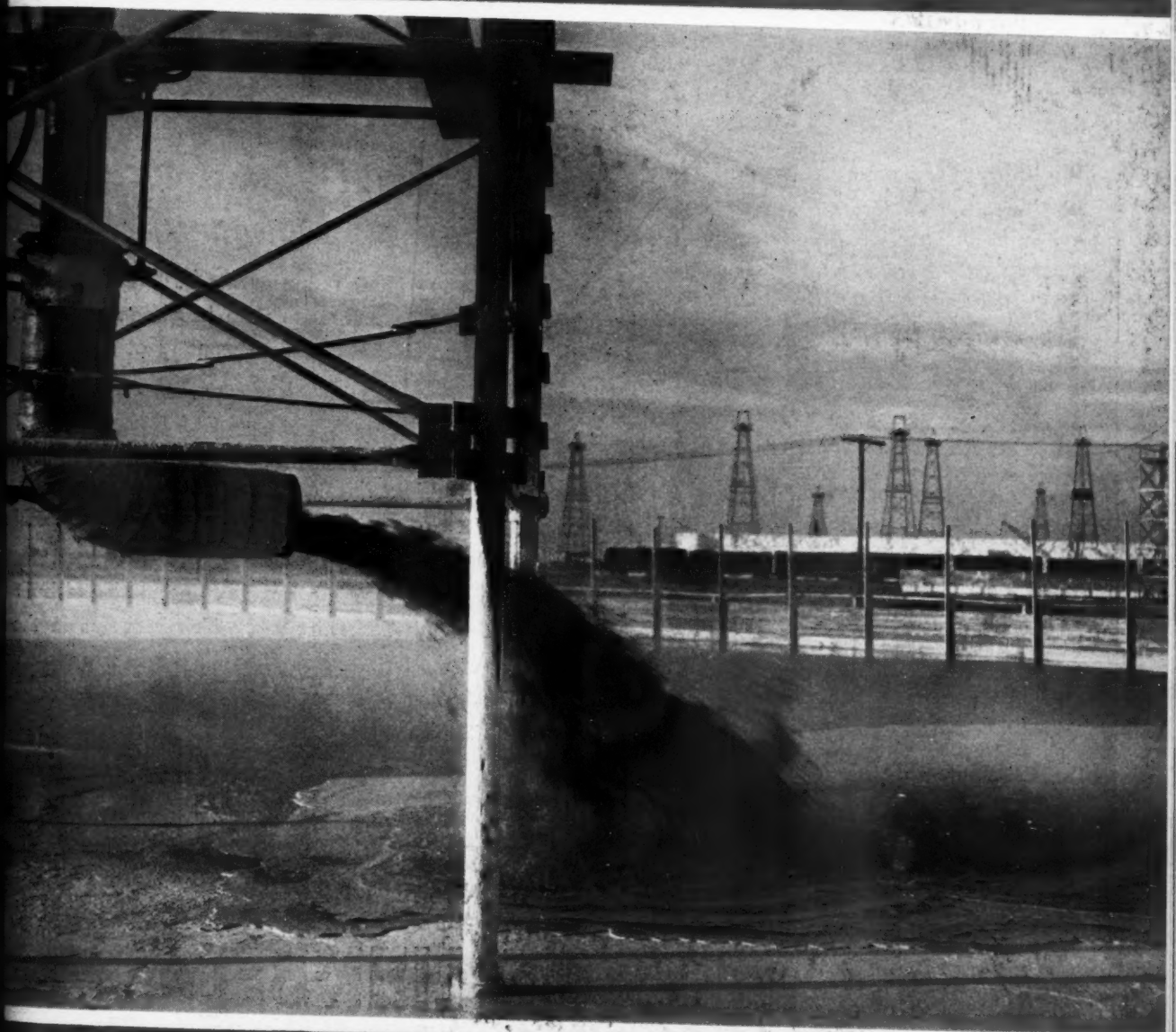
Mining CONGRESS JOURNAL

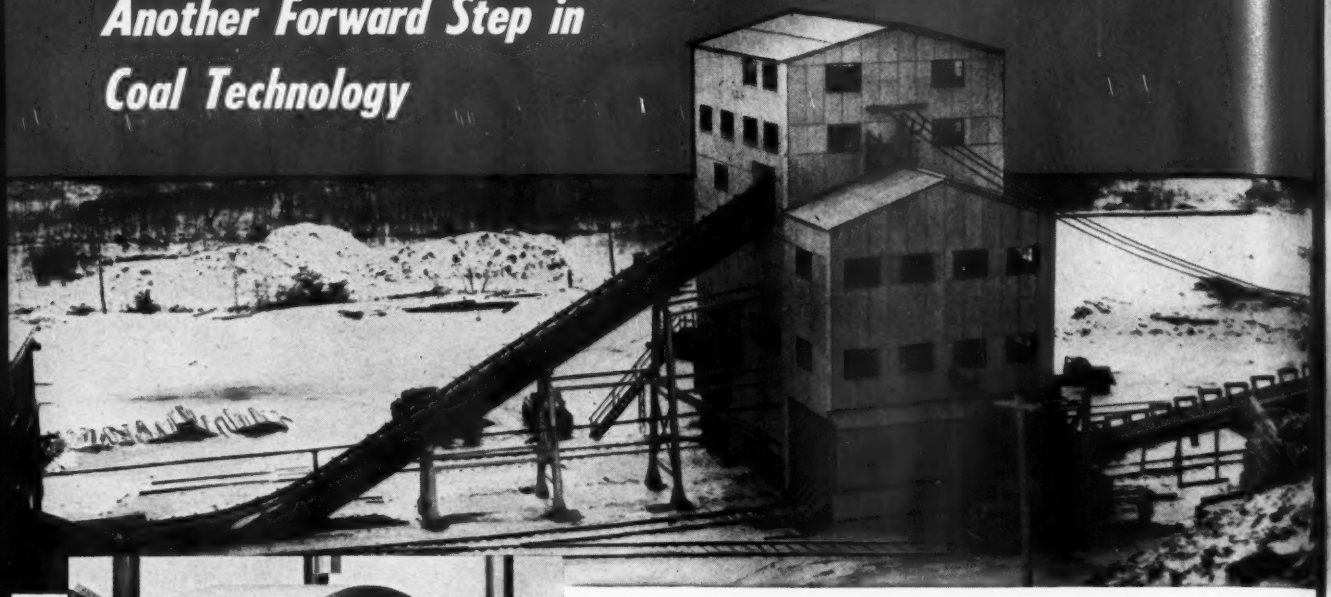
AMERICAN MINING CONGRESS

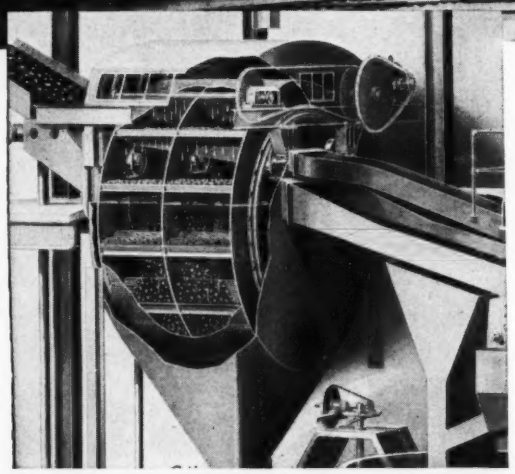
MAY 1949

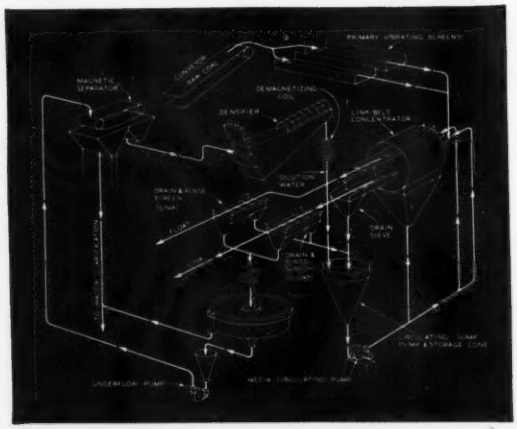


"HEAVY-MEDIA" for Anthracite

Another Forward Step in Coal Technology







*The Heavy-Media Separation Processes are licensed by the American Zinc, Lead and Smelt Company. American Cyanamid Company, 30 Rockefeller Plaza, New York 20, N. Y. are th sole Technical and Sales Representatives for these processes.

Link-Belt Float-Sink Concentrato Scores at Mahanoy City

The first preparation plant featuring the "Heavy-Media"* co cleaning process in the anthracite field has been placed in o eration for the Rhoads Contracting Company at Mahanoy Ci Pennsylvania.

This process which employs magnetite as a medium has alrea been widely used in bituminous coal preparation and metal minin It efficiently removes impurities and produces high grade coal. T Rhoads plant will clean coal from rice sizes up. Hand picking practically reduced to sizes above 4⅜".

The cleaning takes place in a Link-Belt designed and built un called the "Float-Sink Concentrator", which is shown in the cu away drawing at the left. A flow sheet of the process is also n produced. For further details call your nearest Link-Belt office write for Book 2101.

LINK-BELT COMPANY 11.322

Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington, W. Va., Denver 2, Kansas City 6, Cleveland 13, Indianapolis 6, Detroit 4, Birmingham 3, St. Louis 1, Seattle 4, Toronto 8.

COAL PREPARATION AND HANDLING EQUIPMENT

Engineered, Built and Backed by THE SYMBOL OF QUALITY LB LINK-BELT **LINK-BELT**

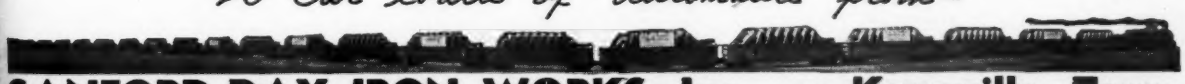
Now..Coal Dust Sealed In!

New S-D "Sealed Automatics" Keep Coal Dust Off Of The Tracks . . . Eliminate Costly Clean-Up!

Now you can have the S-D 1-2-3 "automatic", COMPLETELY SEALED against coal dust leakage. Coal dust that, under certain conditions, would sift through the small space between the drop-bottom door and the car frame, is now carried across this opening by our EXCLUSIVE dust-roof seal. Special coverings protect the axle openings and provide a positive seal against dust at that point. Accumulations of coal dust-roof seal. Special coverings protect the axle openings and pro-removal or clean-up is a costly operation that has run over $10,000 annually in some mines. Mines equipped with S-D "Sealed Automatics" are free of the trouble and expense of coal dust deposits on their tracks . . . that's why many operators have already started replacing old cars with S-D "Completely Sealed Automatics" . . . working toward the day when their mines will be completely dust-free.

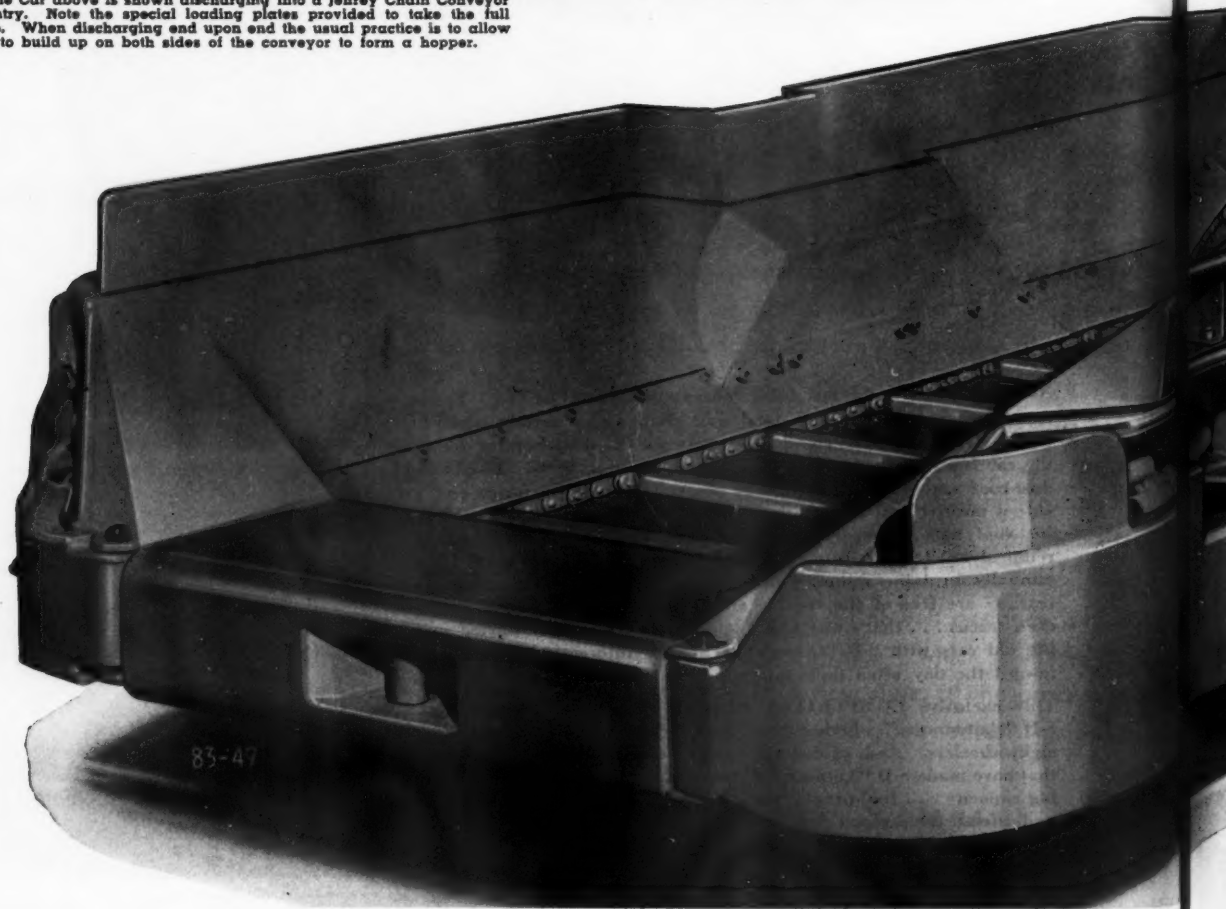
This exclusive COMPLETELY SEALED feature is available on all S-D "Automatics" whether they be 1½ ton regular cars or 30 ton eight-wheelers. And, of course, you still get all the other fine features that have made S-D "Automatics" famous . . . long-life construction . . . big capacity . . . fool-proof "Jerk-Out" unlatching device that operates underneath the car and the automatic 1-2-3 dumping that lays the coal down in the bin gently yet rapidly and with minimum coal breakage. That's the S-D "Automatic" . . . now COMPLETELY SEALED.

20 Car loads of "Automatics" from—



SANFORD-DAY IRON WORKS, Inc. • Knoxville, Tenn.

The Shuttle Car above is shown discharging into a Jeffrey Chain Conveyor in the entry. Note the special loading plates provided to take the full discharge. When discharging end upon end the usual practice is to allow coal to build up on both sides of the conveyor to form a hopper.



DRILLS — CUTTERS — LOADERS — UNDERGROUND CONVEYORS
FANS — BLOWERS — LOCOMOTIVES — WASHERS — CRUSHERS
FEEDERS — LOADING BOOMS — SCREENS — JIGS

LARGE carrying capacity—largest possible payload — hydraulic steering — automatically-operated cable reel — full magnetic control — hydraulic steering and brakes — all-welded construction — hydraulic raising and lowering device for discharge end — all advanced features in JEFFREY Shuttle Cars. Built in three sizes to meet demand for rubber tired haulage underground. Sizes and capacities of the three sizes with average topping are:

Height	Side Boards	Capacity in Tons
30″	0	3.20
	6″	4.22
35″	0	3.75
	6″	4.80
	0	4.75
43″	6″	6.25
	12″	7.75

Jeffrey Engineers are available to help you determine the Cars best suited to your operating conditions.

Trade Mark
Reg. U. S. Pat. Off.

Jeffrey 30″ (and 35″) high Cable Reel Shuttle Car without side boards. Can be furnished with operating compartment on either side—elevating discharge is standard on all cars. Cars available with 4-wheel drive and 4-wheel steering or 2-wheel drive and 2-wheel steering.

The Jeffrey Manufacturing Company

Established 1877

958 North Fourth Street, Columbus 16, Ohio

Sales Offices:	Baltimore	Chicago	Denver	Jacksonville	Pittsburgh
	Birmingham	Cleveland	Harlan	Milwaukee	Scranton
	Boston	Cincinnati	Houston	New York	St. Louis
	Buffalo	Detroit	Huntington	Philadelphia	Salt Lake City
Service Stations:	Pittsburgh	Birmingham		Logan-Beckley	Scranton
	Harlan, Ky.	Mt. Vernon, Ill.		W. Va.	
Foreign Plants:	Jeffrey Mfg. Co., Ltd. Montreal, Quebec	British Jeffrey-Diamond Ltd. Wakefield, England		Jeffrey-Galion (Pty), Ltd. Johannesburg, S. A.	

These facts revolutionized portable mine blowers.

The day has come when your blowers and other mine equipment will be measured against a new kind—made of Alcoa Aluminum. They will be strong, light, lasting, and easy to handle.

When you use equipment made of Alcoa Aluminum, you know that it is backed by sixty years' knowledge of alloys, of fabricating methods, of thousands of test results.

If you have an idea for new equipment in aluminum, Alcoa stands ready to help you with sixty years of experience. Write for "Alcoa Aluminum and Its Alloys", or call the Alcoa sales office nearest you. ALUMINUM COMPANY OF AMERICA, 1478 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

INGOT • SHEET & PLATE • SHAPES, ROLLED & EXTRUDED • WIRE • ROD • BAR • TUBING • PIPE • SAND, DIE & PERMANENT MOLD CASTINGS • FORGINGS • IMPACT EXTRUSIONS
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Contents

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THE AMERICAN MINING CONGRESS
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HOWARD I. YOUNG, *President* · DONALD A. CALLAHAN, *Vice President* · ANDREW FLETCHER, *Vice President* · JAMES D. FRANCIS, *Vice President* · JULIAN D. CONOVER, *Secretary*

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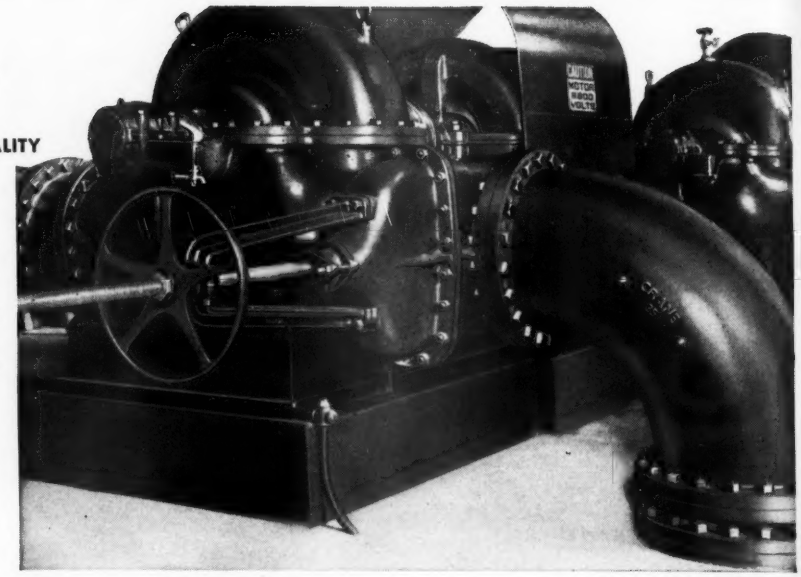
Member Audit Bureau of Circulations

ONE SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY



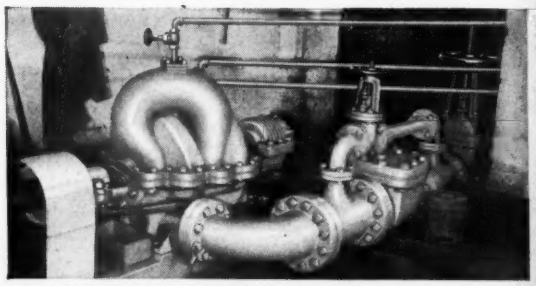
POWER HOUSE *at a copper mine. Crane iron body gate valve, shown here, controls flow of condenser water. Piping for the entire installation can be specified from the Crane line.*

When it's piping for mines ... it's CRANE for complete selection

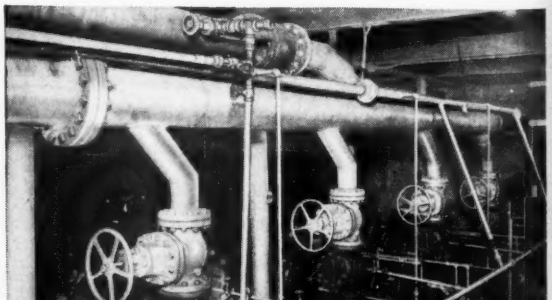
On any mine piping job . . . above ground or below . . . the surest way to get the exact piping equipment you need is to "get it from Crane." For there is no more complete assortment of valves, fittings, pipe and accessories than that contained in the Crane Catalog. One order through Crane Branches, strategically located for your convenience, covers everything—in brass, iron, steel and corrosion-resistant alloys.

Because of the unmatched completeness of this **Single Source of Supply,** many mines have long standardized on Crane to simplify every step of piping procedures. Putting **Complete Responsibility** for materials on one source helps to get better installations, without needless delays on the job. And for **High Quality** in every piping item, get Crane Quality—unsurpassed for more than 90 years.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas



FOR DE-WATERING SYSTEMS *in mines, Crane supplies all piping equipment—valves, fittings, and pipe . . . in brass, iron, steel and alloys.*



PUMP ROOM IN LEAD MINE *featuring Crane 250-pound Ferrosteel wedge gate and swing check valves in outlet lines.*

EVERYTHING FROM . . .

VALVES
FITTINGS
PIPE

CRANE

PLUMBING
AND
HEATING

FOR EVERY PIPING SYSTEM

TAKES TOUGH GOING IN STRIDE ON *SIMPLOT FERTILIZER* JOB

Allis-Chalmers HD-19

Bulldozing and ripping overburden and cap rock at the same time, an Allis-Chalmers HD-19 tractor handles this hard stripping work with ease on the phosphate mining operation of the Simplot Fertilizer Company of Pocatello, Idaho.

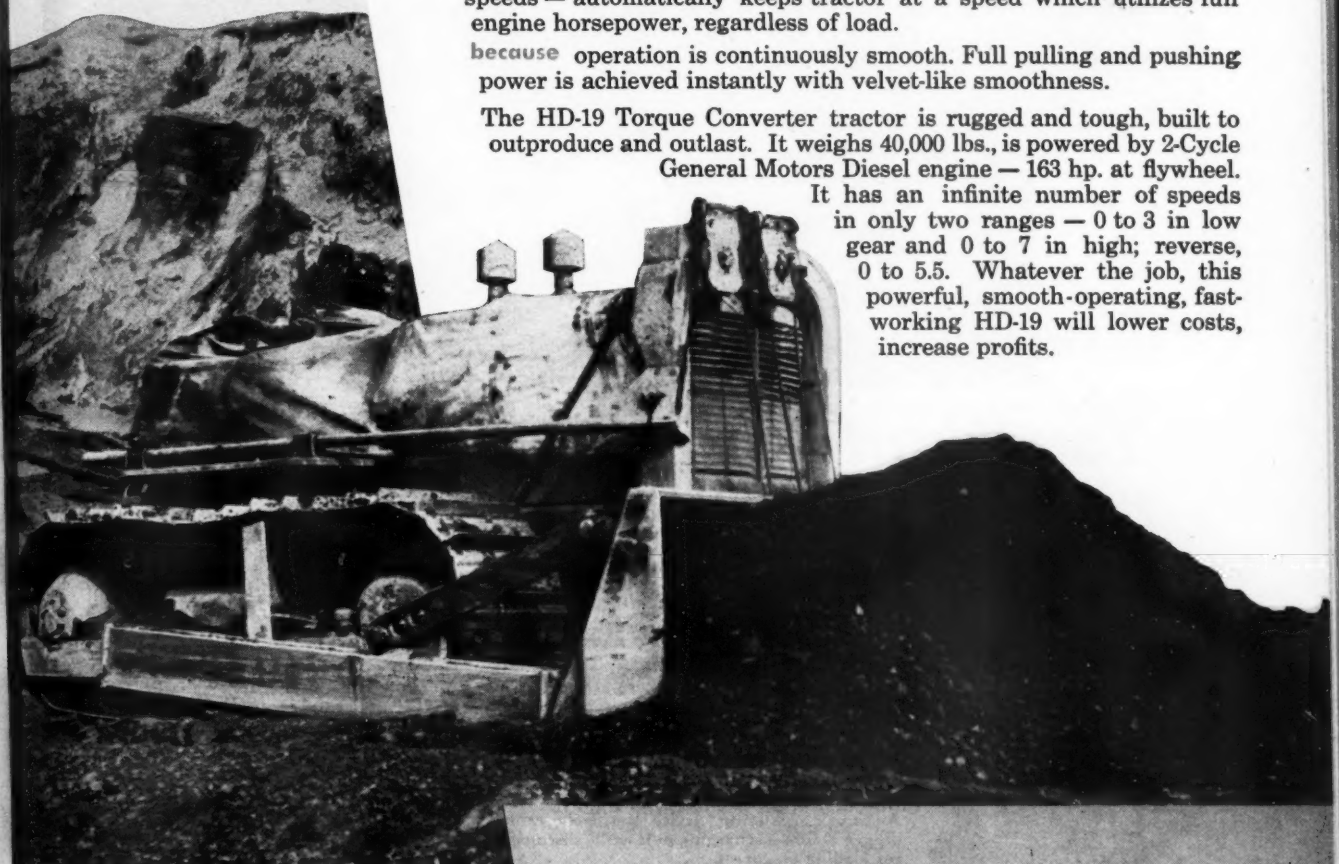
Equipped with hydraulic Torque Converter drive the HD-19 gets more work done, more easily, at less cost —

because engine power is automatically balanced against load; tractor puts in motion any load that can be moved.

because torque converter keeps tractor working at higher average speeds — automatically keeps tractor at a speed which utilizes full engine horsepower, regardless of load.

because operation is continuously smooth. Full pulling and pushing power is achieved instantly with velvet-like smoothness.

The HD-19 Torque Converter tractor is rugged and tough, built to outproduce and outlast. It weighs 40,000 lbs., is powered by 2-Cycle General Motors Diesel engine — 163 hp. at flywheel. It has an infinite number of speeds in only two ranges — 0 to 3 in low gear and 0 to 7 in high; reverse, 0 to 5.5. Whatever the job, this powerful, smooth-operating, fast-working HD-19 will lower costs, increase profits.

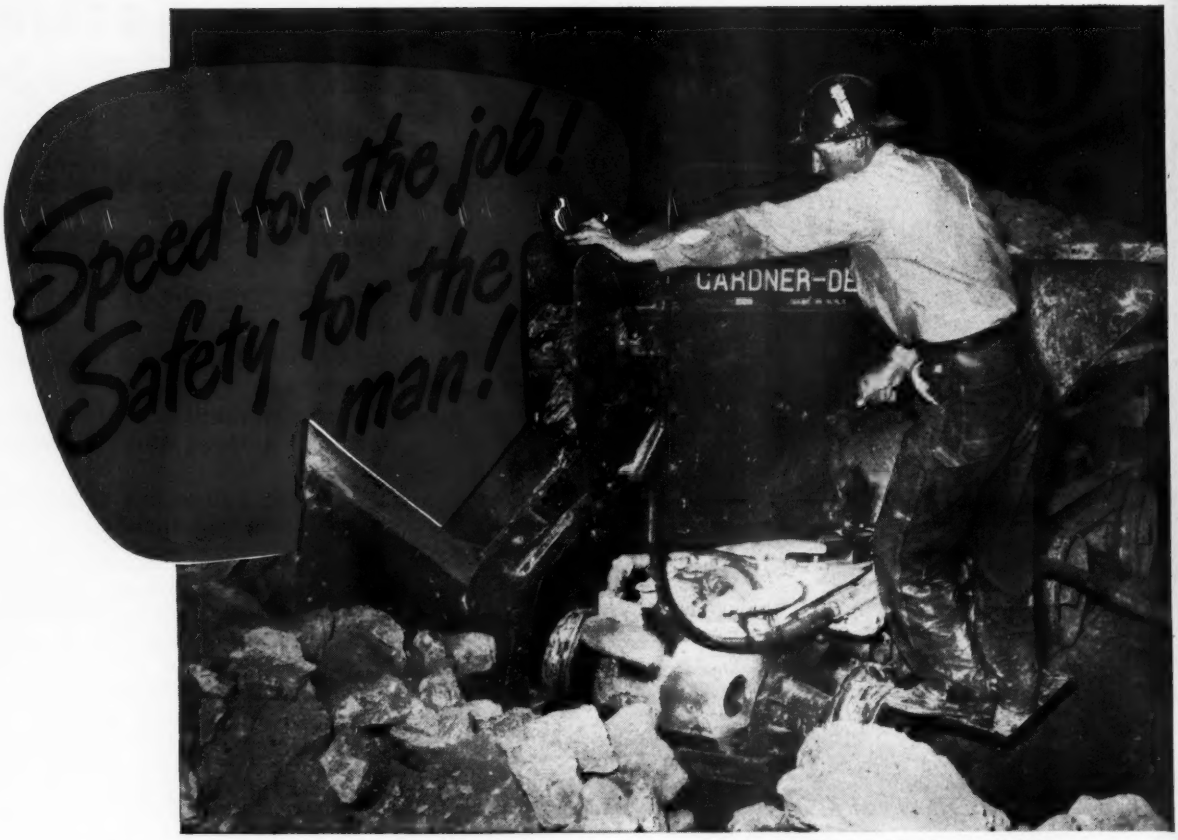


Allis-Chalmers HD-19 tractor, equipped with Gar Wood cable tipdozer and CU2 control unit, is bulldozing and ripping overburden and cap rock on the Simplot phosphate mining operations. Over a million tons of overburden at a depth of as much as 100 feet have been removed in the past three years.

Photos were taken in near zero weather at an altitude of 5700 feet. Tractor is shielded with a canvas cover to keep operator warm.

ALLIS-CHALMERS
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

★ ORIGINATOR OF THE TORQUE CONVERTER TRACTOR

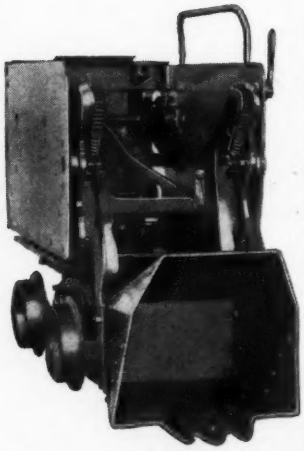


Gardner-Denver "Big Bite" GD14 Mine Car Loader

You Want Both

Faster loading of bigger tonnages — cleaner mucking in less time — *plus* greater safety for their miners! That's how operators throughout the mining world are *proving* the *superiority* of Gardner-Denver Mine Car Loader design.

And what's behind this remarkable record of performance? You'll find the answer in superior Gardner-Denver engineering — backed by ninety years of manufacturing craftsmanship. Gardner-Denver knows underground mining problems. Gardner-Denver Mine Car Loader specifications were developed under actual working conditions. That's why you'll find every feature of the "Big Bite" GD14 Loader exactly suited to your underground mucking needs.



Gardner-Denver GD9 Mine Car Loader — Companion to the GD14 — for use where low headings require a smaller loader — sturdy and fast mucking.

EXTRA POWER AND SPEED — For loading large mine cars are provided by two 5-cylinder radial air motors. Both motors function in the powerful crowding action — a result of the famous Gardner-Denver fulcrum principle.

EXTRA WIDE CLEANUP RANGE — Loads scattered muck faster. Adjustable swing stops provide four digging positions on both sides of the track. Automatic centering device positively centers dipper before discharging — is easily disengaged for loading on curves.

EXTRA SAFETY FOR THE OPERATOR — Low center of gravity protects operator — assures maximum stability on the track. Clean exterior design — with a minimum of outside piping and conveniently located controls — and sturdy operator's platform — are other important safety factors.

EXTRA SHOCK PROTECTION — Power automatically cuts off just as dipper reaches upper or lower limit — protects against unnecessary shock. Equalizer evens pull on dipper chains — minimizes crowding shocks. Heat-treated forgings are used throughout for extra strength and toughness.

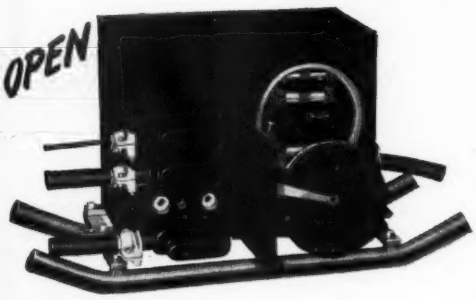
GREATER SIMPLICITY — Simple shaft drive through beveled gears minimizes wear and friction. Built-in line oiler and easy-to-reach fittings simplify lubrication. Loader easily knocked down into sub-assemblies for moving through small shafts or raises.

For full information on the "Big Bite" GD14 Mine Car Loader, or on the sturdy, smaller GD9, write Gardner-Denver Company, Quincy, Illinois.

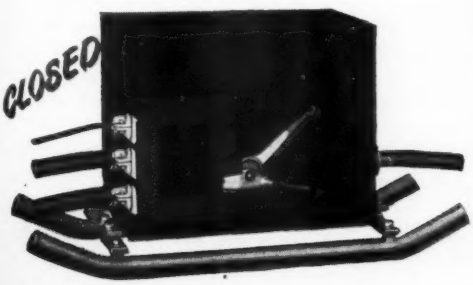
GARDNER-DENVER

SINCE 1859

Fool-Proof Interlock Prevents Opening O-B Distribution Boxes with Power "On"



It can't be opened with power "on." When the disconnect switch is closed, the position of the operating handle prevents access to either plug box or fuse compartment.



Safety is made an integral part of O-B Permissible Distribution Boxes. Because of an ingenious interlocking arrangement, branch circuits can be plugged into the boxes only when the power is off. Fuse compartments, as well, cannot be opened unless the incoming power circuit is broken. There's no chance for loss of memory—only with the disconnect switch **opened** can access be gained to the inside compartments of the box.

Play safe . . . protect your workmen and your tonnage . . . use O-B Permissible Distribution Boxes at the face and other locations requiring several individual power circuits. Employing reliable cartridge fuse protection, O-B boxes are available with connection facilities for either two or three branch circuits. For complete engineering data, fill out and mail the attached coupon today.

3014-M

Ohio Brass Ⓑ

MANSFIELD, OHIO, U. S. A.

Please send complete engineering data and catalog information on O-B Permissible Distribution Boxes.

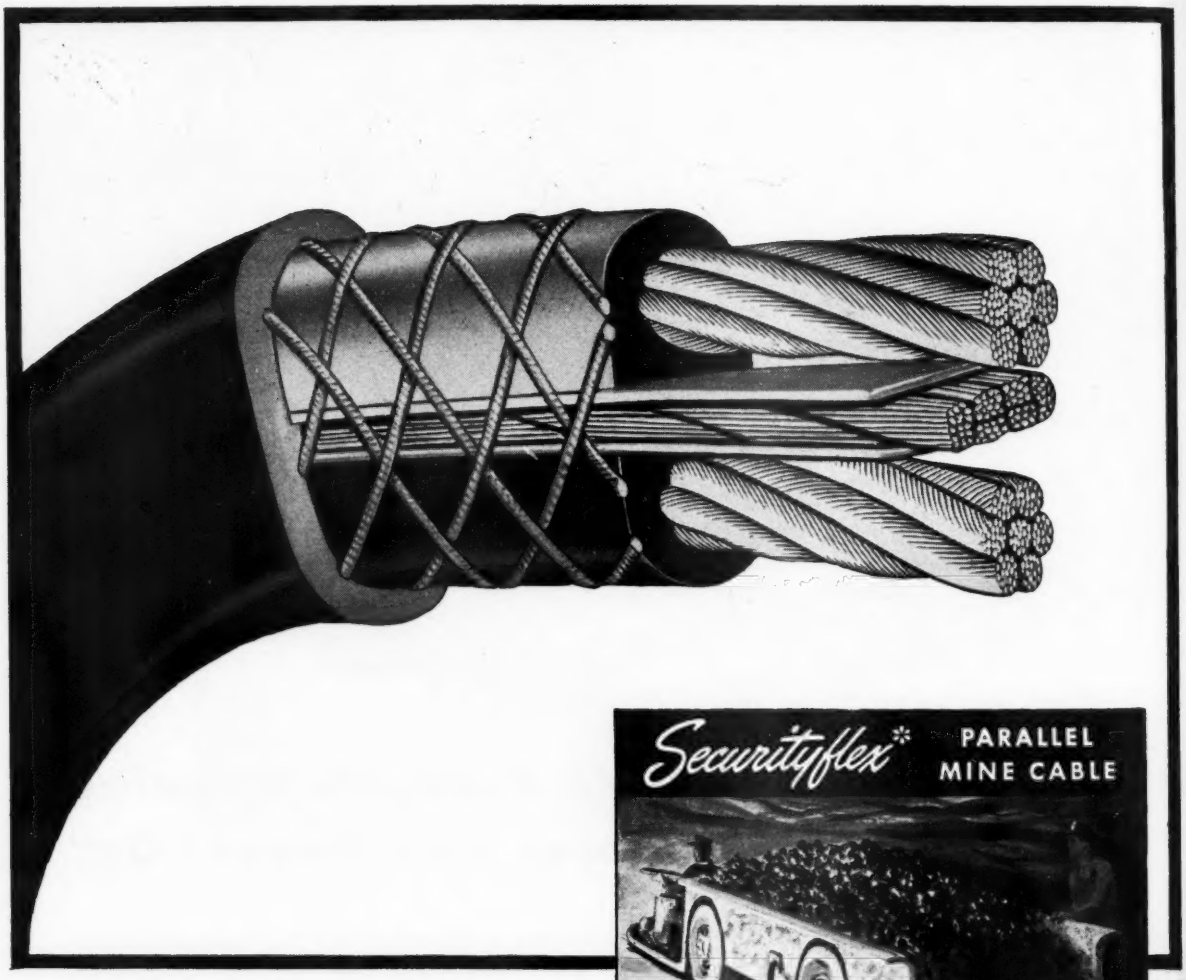
Name .....

Company ..... Title or Dept. .....

Address .....

City ..... Zone .... State .....

(Canadian Ohio Brass Co. Ltd., Niagara Falls, Ont.)



BUILT TO DELIVER
MORE TONS PER CABLE

"SECURITYFLEX" has grown to mean *leadership* in mine cable as a result of . . .

Anti-short breaker strip between conductors (available in cable with or without grounding wire) . . . crush resistance . . . special heat resistant insulation . . . rugged neoprene jacket that resists flame and abrasion . . . non-kinking construction . . . assurance of more continuous service. All this means *more tons per cable.*

Securityflex meets all requirements of the U. S. Bureau of Mines Flame Test and diameter specifications. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

NEW DESIGN GIVES LONGER SHUTTLE CAR SERVICE

Shuttle car service demands a cable that can take it. The inherent advantages of Securityflex Parallel Mine Cable, coupled with a recent improvement in design that greatly reduces grounding wire failures, make this cable more suitable than ever for shuttle car use. You will find this parallel mine cable gives longer, safer operation under the extreme cable tensions encountered in shuttle car service.

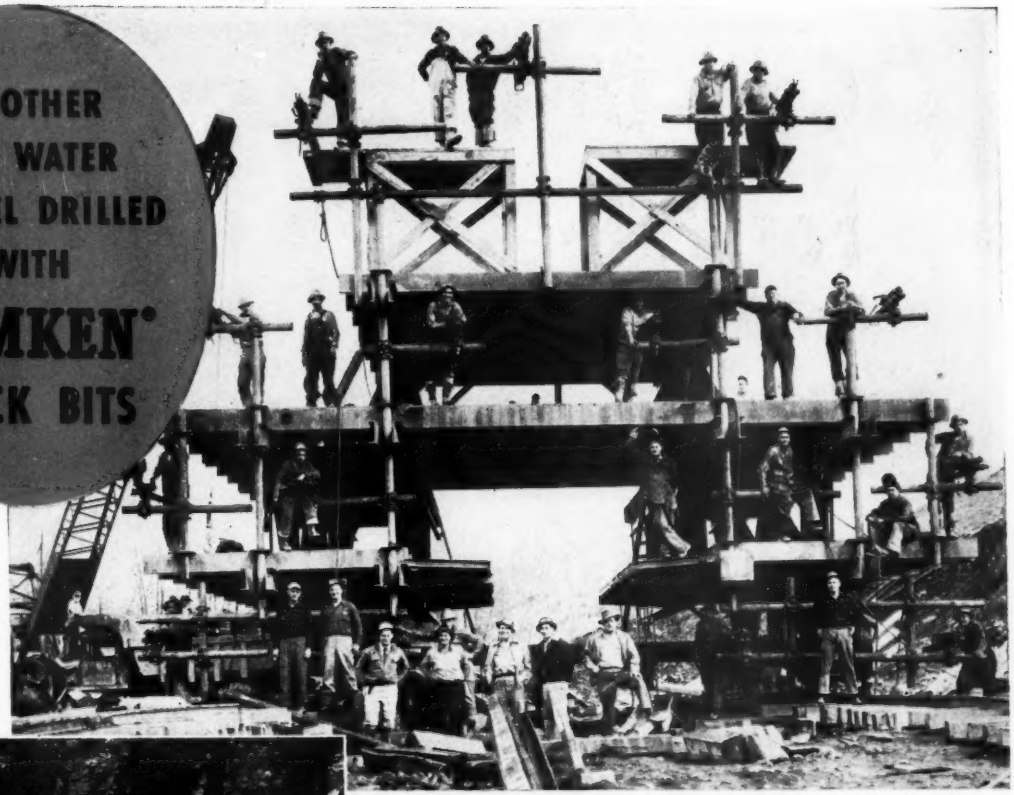
45475

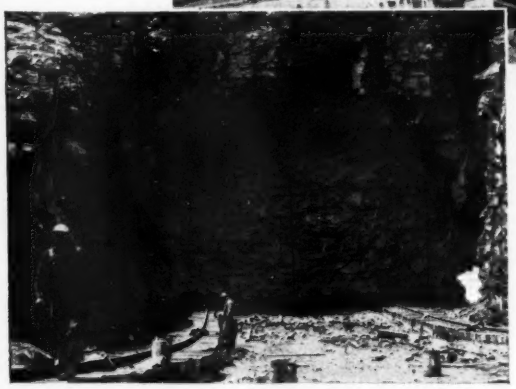
ANACONDA *Securityflex** **MINE CABLE**

ANACONDA

*An Anaconda Trade-Mark

ANOTHER BIG WATER TUNNEL DRILLED WITH TIMKEN® ROCK BITS





Photographs courtesy Gardner-Denver Company, Quincy, Illinois

Walsh-Perini Construction Company, Downsville, New York, recently completed the drilling of one of the largest rock tunnels ever constructed — the largest since the construction of the Hoover dam.

This big water diversion tunnel is 2,200 feet long. It is part of a $13,700,510 project to bring water from the East branch of the Delaware river to New York City. 165,000 cubic yards of rock were excavated in the construction of the tunnel.

Top heading was drilled with Timken Rock Bits in Gardner-Denver CF99N Automatic Feed Drifters. The drifters, 20 in number, were mounted on the world's largest jumbo. The 17 ft. bench was drilled with Timken Bits in 8 Gardner-Denver D99D Wagon Drills. In finishing the job within the time set, the contractor has expressed complete satisfaction with the performance and economy of Timken Bits.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
ROCK BITS

THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO - CABLE ADDRESS "TIMROSCO"

• Core Drill For Values

WITH A

LONGYEAR UG STRAITLINE

Potential wealth in your mineral property is of little use until actual values are disclosed by a few well placed drill holes.

Diamond core drilling will reveal the nature of material penetrated, the location and size of your orebody. The grade of ore can be determined by analysis of core and sludge samples recovered.

Deep drilling may be required—depths to 2000 feet. Gasoline or diesel driven, the Longyear UG Straitline has the power and stamina for just such service. Air or electric models are also available. Vertical or angle holes can be drilled. Manual controls conveniently located, govern bit advance and speed, also lowering and hoisting of drill rods. A 4-speed transmission conveys power to the hoist, or to the drilling head which may be either a hydraulic or screw feed type.

● Drilling capacities are: 2000′ of 7/8″ core; 1600′ of 1 1/8″ core; 1200′ of 1 5/8″ core; 1100′ of 2 1/8″ core.

A Longyear UG Straitline will prove up values in your property.

Write for Bulletin No. 57

Longyear core drills are manufactured in a variety of sizes and models with capacities from 100′ to 8500. Longyear rods, bits, core barrels and other supplies are carried in standard sizes.

E. J. LONGYEAR COMPANY

MINNEAPOLIS, MINNESOTA, U. S. A. NEW YORK OFFICE, 1775 BROADWAY

CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO, CANADA

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS

REPRESENTATIVES IN PRINCIPAL MINING CENTERS OF THE UNITED STATES AND OTHER COUNTRIES

FOR SALE—Equipment Never Placed in Operation

Eight-ton Capacity Double Skip Mine Hoist

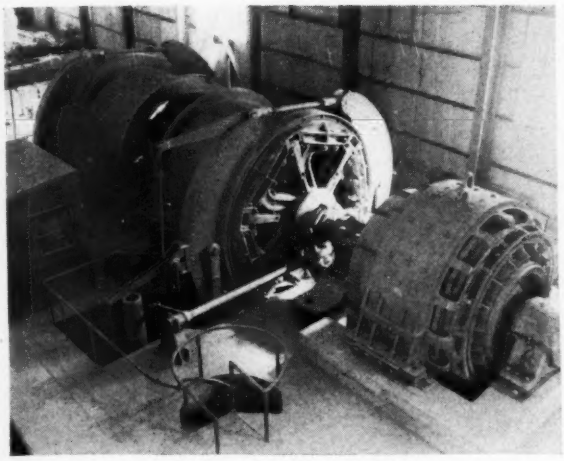
●

Head Frame, Idler Towers, Hoist, Skips and Hoist House

●

Complete Electric Control

●

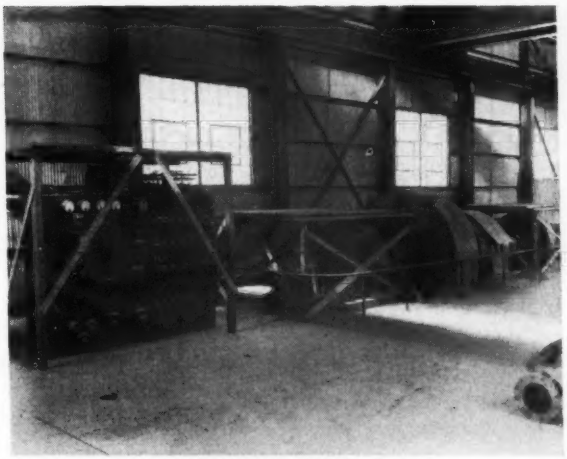


HOIST AND DRIVE MOTOR

NORDBERG, double drum hoist equipped with electric drive and Ward Leonard control; direct drive through flanged couplings on the shaft and clutched drums. Hoist motor—2700 hp, 650 volt dc 66 rpm—arranged for forced ventilation.

ARRANGED for normal balanced operation with 15,600 lbs. of ore per trip. Can be operated unbalanced for two hours with the same load. Drums to wind 4,580 feet, hoist equipped with 4,280 feet of 1⅞" diameter hoist rope. Skip weight 14,000 lbs.

FLYWHEEL MOTOR, generator set; two 1250 kw, 650 volt, 680-580 rpm dc generators; one 2500 hp, 6600 volt, 3 phase, 60 cycle, 10 pole wound rotor induction motor; one 45 kw, 250 volt exciter; one 85,000 lb. 10 foot diameter plate flywheel; one No. 4 Lewis type liquid slip regulator for 2500 hp motor; one controller and switchboard for operation and protection of the hoist motor, flywheel motor generator and exciter.



SWITCHBOARD AND M.G. SET

HEAD FRAME AND IDLER TOWER WITH HOIST HOUSE IN THE DISTANCE

ALL STEEL head frame, idler towers and steel construction hoist. Galvanized corrugated iron roof and siding. Aniti-friction main sheave bearings.

Included are three 2-deck cages and three 7.8-ton skips.

THIS HOIST was installed in 1930 and was never placed in operation. All parts have been well protected. Complete brochure and price available on request. Equipment is accessible for immediate inspection at owner's plant in Jerome, Arizona.

Address All Inquiries to P. G. LEE, General Purchasing Agent

PHELPS DODGE CORP.

40 Wall Street, New York 5, New York

Finders Keepers!

Mine and quarry owners the world over have found that Bucyrus-Eries, like the 2½-yard 54-B electric shovel shown working in a Minnesota iron mine, can deliver the consistently high output they need. They've found through experience that Bucyrus-Erie "years ahead" design, expert craftsmanship and the use of top-grade materials produce a machine that stands up to hard digging over long periods with remarkably low maintenance and repair costs. Operators have found that Bucyrus-Erie's responsive Ward-Leonard control means a faster, smoother cycle — producing more yardage every shift, yet easy on both operator and machine. Keep these facts in mind when choosing your next heavy-duty excavator.

56L48

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

★ Mining ★
CONGRESS JOURNAL
Published for the Entire Mining Industry
by the AMERICAN MINING CONGRESS
SHELDON P. WIMPFEN, Editor
VOLUME 35 MAY, 1949 NUMBER 5

Another Assault on Small Business

A PENDING Administration Social Security bill would place mine "leaser" and other independent contractors in the category of employes. Although but a single arrow in the many volleys being discharged at the citadel of individual freedom, it is worthy of serious consideration.

The 10,000 miners operating for their own account in various Western states are self-employed. Their ability, ingenuity, and enterprise have led them to become independent contractors where they have an ever-present opportunity to realize, and frequently do receive more than average rewards. Now in the name of "security" they may be forced to sacrifice a part of their economic freedom by being classified as employes.

Liberty was recognized by our nation's founders as being equally compounded of political, personal, and economic freedom. Our first law makers were spurred on by the bitter experiences of the people under the autocratic government of Europe. Confident that free men would exert their best efforts for themselves and society, they took precautions to limit the powers and functions of the government over the individual.

During the early thirties, these rights were encroached upon, ostensibly to put the country back on its feet. The concerted effort essential to win the war required further sacrifice of personal freedom. Now the government is in many ways the dominant force in our economic life and the few powers it lacks to impose complete authority have already been proposed to Congress.

These measures call for complete control of agriculture and industry. They would make the people dependent upon government for housing, medical care, education, and protection against all hazards.

Of basic importance to the future of the mining industry is retention of the status of mine leasers as independent contractors. Only by maintaining incentive for them to operate on their own and uncover and extract promising orebodies which the large companies might otherwise pass by, can the most efficient use be made of mineral resources.

Any measure, whether dealing with social security, wage-hour, labor relations, or what have you, which fails to recognize this vital principle of independence is bad for the mining industry and the nation.

Prescription for Depression

DESTROY confidence with the poisonous atmosphere of an unrealistic government-business or labor-management attitude—boost wages beyond the basis of greater productivity—legislate "security" measures beyond ability to pay the bill—steer a course of government spending built upon incentive-stifling taxation or deficit financing. Such actions could fulfill the predictions of the lads behind the Iron Curtain who have been saying for years that, left to its own devices, capitalism would destroy itself.

Time for Revision

RECENT weeks have seen the prices of nonferrous metals, steel scrap, and other raw materials decline. This was to be expected as pent-up war-time demands became satisfied and inventories filled. But the return to a normal competitive market raises a number of serious problems. As to coal, a major problem is the need for unified action by workers and management to fulfill their joint objective—to keep coal mining activity at a high level.

A declining market and price for coal dictate a reduction in production costs. George H. Love, president, Pittsburgh Consolidation Coal Co., stated recently, "During the last decade, wages in coal mining have gone up faster than any other industry. But, to give stable employment from this point on, we must now have the increased productivity per worker to cover the rapid increases already made."

In spite of the serious reductions in the coal market resulting from dieselization of the railroads, lower export shipments, declining industrial activity, and inroads of competitive fuels in domestic heating, the bituminous coal industry may again be confronted with union demands for more pay benefits. Inconsistent as such demands would be with the present state of business activity, union leaders have historically sought them.

In his talk, Mr. Love pointed out that "The delivered cost of coal to the consumer will determine to a large extent the amount of coal mined in the next ten years." Every effort has been and is being made by management to equip mines with the required tools to supply coal at minimum cost to the consumer. In the coming negotiations labor will have an opportunity to demonstrate its knowledge of economics and to take suitable action to assure coal's position in competitive industry.

This is the time for revision. Failure to recognize and accept the realities of the situation could seriously threaten the entire industrial economy. It could mean idle mines and miners. It has happened before—here!

Stripping operations are in progress at Ray, Ariz.

Open-Pit Mining Solves Economic Problems

Conversion at Three Arizona Mines Increases Tons Per Man Shift

By A. E. MILLAR
Pit Development Superintendent
Inspiration Consolidated Copper Co.

ONE OF the recent interesting developments in the mining field in the State of Arizona has been the start of open-pit operations at three of the copper producing properties. In alphabetical order they are: Bagdad Copper Corp., Bagdad, Yavapai County; Inspiration Consolidated Copper Co., Inspiration, Gila County; and Kennecott Copper Corp., Ray Division, Ray, Pinal County.

These properties have been producing units for many years, but solely by underground methods. Block caving was the common mining method.

In all cases the advent of pit mining has not been caused by the discovery of new ore bodies; rather, it has been decided that for certain reasons it was desirable to recover sections of the already known ore reserves by open pit rather than by underground. At both Inspiration and Ray the open-pit mining will supplement underground mining, however, at Bagdad, production will come entirely from the pit.

It is only within recent years that improvement has been made in equipment which today permits the open-pit mining of small areas. Improvements in power shovels such as the full revolving shovel with tractor treads provides greater flexibility, also truck haulage has advanced to such a point that steep grades can be negotiated.

Common Factors

Although other factors have considerable bearing, the main factor is the cost of mining and delivering ore to the plant. The actual cost of mining ore by open pit is controlled principally by the waste to ore ratio and the transportation of waste and ore.

Each ton of ore mined must bear the actual cost of mining the ore plus the cost of mining and removing waste. If it costs 20¢ to mine a ton of material be it either ore or waste, with a waste to ore ratio of ½ to 1, the cost against the ton of ore would be 30¢, but if the waste to ore ratio is 3 to 1, the cost against the ton of ore would be 80¢.

Transportation costs can increase greatly due to the length of haul and grade of haul; it matters little whether the grade be up or down, either one adds greatly to the cost achieved for level haul.

Unit costs for underground mining at all three properties have been and

are considerably higher than open pit estimated unit costs. For instance, the cost of supplies, particularly timber, one of the largest supply items used in the block caving system, has increased to a point where, under the most favorable conditions, timber costs alone approach 10¢ per ton. In mines where it is considered necessary to increase timber requirements due to heavy ground this timber cost approaches 20¢ per ton mined.

TONS PER MAN SHIFT UNDERGROUND COMPARED TO OPEN PIT

	Tons per man shift	
	Underground	*Open Pit*
Bagdad	21	65*
Inspiration	30	90
Kennecott-Ray	25	80-90†

* Will increase.
† Estimated.

In all three instances the change to open pit has resulted in a greater tonnage with a lower over all grade of copper. Lower mining costs have permitted the lowering of the cut-off between ore and waste; also in the pit operation it is possible to recover considerable "fringe" ore which would be lost to underground block caving. The increase in tonnage is a great influencing factor. On the other hand, the decrease in over all grade of copper is not serious provided it can be mined, beneficiated, and sold at a fair profit. On the other side of the picture consideration must be given to the fact that in many cases the increased tonnage and lower over all grade may necessitate an increase in plant facilities in order to maintain a certain production rate of copper. Calculation of tonnages and grades are influenced by over all slopes, cut-off between ore and waste, and lowering the cut-off provided the material would have to be removed in any case.

In the three properties under discussion the over all slopes are figured at 45 deg with the exception of Bagdad, 55 deg; the cut-off between ore and waste is 0.6 percent total copper; and it may be possible to go to 0.4 percent copper as an economic cut-off, provided plant conditions and market price might warrant same, and also provided that this material (between 0.4 percent and 0.6 percent) lies within the pit limits and must be removed in any case.

In the economics of calculation it must be remembered that most of the material classified as waste at all three properties, carries some values in the form of oxide (soluble) copper. Provision has been and will be made for the disposal of this material in suitable areas so that some recovery may be made at a later date by heap leaching.

Varying Conditions Influence Conversion

Several years ago at Bagdad, when block caving was started, it was only necessary to furnish 300 tons ore daily, the then plant capacity. In order to operate as cheaply as possible, no grizzly level was installed between the undercut and main haulage. The area developed was limited.

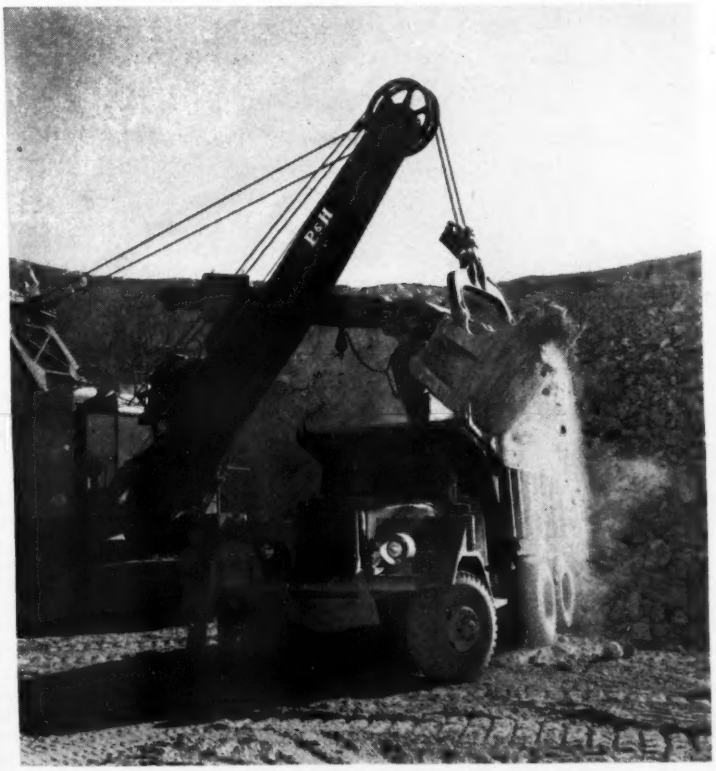
Early in 1943 the concentrator capacity was increased to 2500 tons daily. It was at that time found impossible to obtain the required tonnage under the then existing conditions; it was also found that in the desire for tonnage the heavy drawing in the caving area caused funneling through to the surface which resulted not only in grade dilution but also in the drawing of "close to the surface" oxide material which was detrimental to mill recovery.

The mineralized area at Bagdad consists of oxide copper ore for about the first 60 ft, chalcocite for 100 ft, then a primary (chalcopyrite) zone for 100 to 150 ft. Open-pit operations permit segregation of the oxide and sulphide, the oxide material being removed to waste dumps where it can be leached in place at a later date, and the relatively clean sulphide shipped to the mill. With the flexibility in pit work it will be possible to further increase the tonnage as may be required by expansion in plant facilities.

Up to 1928, at Inspiration, the beneficiation of the ore was by flotation-concentration, but, since 1930, leaching has accounted for practically all output, a small section of the original concentrator being used for the treatment of slimes.

Inspiration's ore bodies are a mixture of sulphide and oxide copper minerals, and in order to produce the required monthly production of copper, control of grade and the relative proportions of sulphide and oxide is essential. Open-pit mining, with its flexibility as to tonnage and grade, assists greatly in combining with underground mining for such control.

At Ray the ore bodies are divided into area No. 1 (on the east) and the adjoining area No. 2 (to the west). The eastern half of area No. 1 has been mined out and the west half of area No. 1 is that which will be removed by open-pit methods. Underground mining continues in area No. 2. In order to remove the west end of area No. 1 by underground caving it would have been necessary, due to the dip of the ore body, to open up and maintain several levels which in turn would add to an already high underground mining cost due to heavy ground.



Shovels with 4½-cu-yd dippers move Inspiration ore

Operational Plans

In addition to the types or sizes of equipment utilized such points as over-all slopes, shapes of areas involved, preliminary stripping required, waste to ore ratios, grade cut-offs, etc., are of utmost importance and must be given careful consideration.

Shovels and transportation are two of the important items in pit equipment, and are closely related. The size of shovel and size of dipper are controlled by such factors as tonnage required, class of ground, height of bank, and size of crushing equipment.

Closely related to shovels is the question of transportation. Transportation is usually by rail, truck, or belt conveyors; chief among the influencing factors are size of ore body, depth of ore body, length of haul, and how much grade haulage involved. Rail haulage can only be applied when the size of the ore body warrants its use. It is usually desirable to keep the railroad grades to a maximum of 4 percent, and it is practically impossible to use railroad haulage in the smaller pits and especially in those which vary greatly in elevation. Other requirements for railroad haulage are a long haul and a total daily tonnage of sufficient quantity to justify the investment in necessary track installation and rolling equipment.

In deciding upon the use of trucks, one of the main points to be given careful consideration is the steepness of the grades involved. Naturally, it is economical to handle as large a payload as possible. On the other hand, truck haulage to date has been limited due to the available size of power units. Diesel-operated equipment is much more economical than that operated by gasoline, but Diesel automotive power is limited at present to a maximum of about 275 hp. However, certain companies are experimenting with units of 300 hp and 500 hp. One of the proven power units of 300 hp is that using Butane or Propane gas. There is a great field for the development of heavier Diesel equipment.

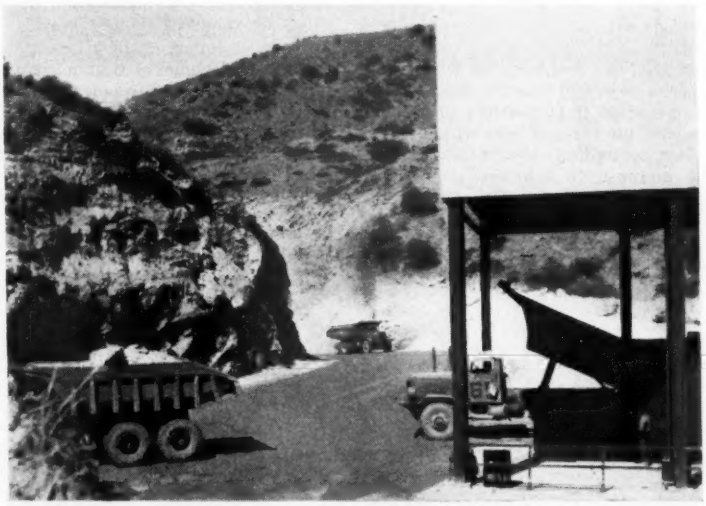
Belt conveyors are useful, especially when removing ore over a grade exceeding 10 percent. Conveyors can operate up to an incline of 18 deg or 32 percent; the degree of incline on the conveyor is controlled by the size of material placed on the belt. However, in using belt conveyors for open-pit mining operations some type of crusher should be installed in the bottom of the pit, thereby assuring a controlled size of material placed on the belt.

Bagdad—Open-pit operations were started in 1945, the ore being transferred from the surface through raises to the underground haulage level. The tram on the underground haulage level was 1200 ft to the hoisting compartment, at which point the ore was raised to the crushing plant of the mill, a vertical height of approximately 340 ft. In this way the daily requirements for the mill were met. However, the cost was still too high as the chute tapping, underground haulage and hoisting added much to the cost of open-pit mining. In 1947 a jaw crusher was placed in the bottom of the pit and the ore, after passing through this jaw crusher, was raised to the plant crusher by means of a conveyor.

Recently it was possible to eliminate entirely the transfer underground, and today all material from the pit at a rate of 3000 tons daily is being trucked to the crusher in the pit bottoms and carried by conveyor to the plant. The crusher in the pit proper is of the jaw type, 40 by 42 in., and has a capacity of 3000 tons in 12 hours, crushing to 6-in. size. This crusher discharges, by means of a short length of conveyor, into storage bins excavated out of rock. This bin has a live storage of 8000 tons, or sufficient for a little better than two days' operation of the mill. The crusher is placed on a solid concrete foundation, and it is estimated that it will be necessary to move the crusher once every four or five years.

At present the conveyor in use is 1000 ft long and rises at an angle of 17½ deg. The material is handled on a 36-in. width belt. The section of conveyor in use at present will be permanent, and as the pit advances and it becomes necessary to move the jaw crusher, temporary sections of conveyor belting each 1000 ft long, will be placed on the bottom level of the pit, carrying the material from new locations to the present 8000 ton storage. At present the cost of crushing and conveying approximates 3½¢ per ton. Ore handling at the Bagdad pit will all be on a level or a downhill haul, with a maximum length of haul of about ¼ of a mile, this being possible due to the fact that the crusher on the bottom level will be moved for each 1000 ft of advance around the hillside.

Waste removal will either be level haul or uphill, and a great amount of the waste will have to be moved over steep grades, resulting in higher haulage costs. Waste dump areas are limited, as the ore body lies on the north side of "Copper Creek" and the only two outlets for waste disposal would be either at the east end or the west end of Copper Creek. The original ore body for underground mining was estimated at 6,000,000 tons of 1.25 percent copper. Diamond drilling has added additional ore until today it is estimated that there are available for about 18,000,000 tons of ore of 0.9 percent copper. Additional drilling will be carried on in the hope that even this amount can be increased.



Inspiration open-pit ore reaches primary crusher

Although the mill can now handle about 3000 tons per day, plans are being made to add an additional ball mill which will permit the treatment of 4000 tons daily. Eventually, it is hoped that sufficient equipment will be added to bring the capacity up to 10,000 tons per day. Ore is being loaded by a 2-yd or 2½-yd shovel into 10-yd trucks and hauled to the jaw crusher in the pit. Waste is being loaded by a 4½-yd shovel for removal to the waste dumps. It is expected that 20-yd trucks will be available in the near future for waste removal.

Inspiration—The study of the possibility of open-pit operations was not carried out with any thought of increasing the total daily tonnage. No changes were contemplated, nor are

any contemplated to the present plant. The areas involved in the open-pit program have increased ore reserves a little but not to any great extent. Combined grade of open-pit ore, together with underground, will average about 1 percent total copper. It was decided to use shovels of 4- or 4½-yd dipper capacity, each of which should be capable of delivering between 4000 and 5000 tons per shovel shift.

One of the main problems involved was the question of how to deliver the ore. Three possible methods were considered. By opening one of the existing large underground ore passes, and concreting it with heavy reinforcing, this could be used to take the ore from the pit, drop it to the 600 level underground, from which point it would be trammed to the Inspiration shaft and hoisted to the present plant. The cost of reconditioning the large ore pass, also the cost of tramming and hoisting were considered to be too high.

The second possibility given consideration was the transporting of material by belt conveyor; the length of haul, also the necessity for transfer points, installation of a crusher someplace in the pit and the erection of necessary bins might have been feasible, but in order to reach the present plant it would have been necessary to place the conveyor structure at a high elevation at the place where it would have crossed what is known as Webster Gulch.

The third scheme, and the one adopted was that of trucking, which proved to be the most adaptable and economical and which also resulted in a much simpler operation. Under this plan the bench approach roads come from the respective benches as required and join the main haulage road placed outside the pit but close to the pit limits. This main haulage road is carried on a 7-percent upgrade.

Another problem at Inspiration was the fact that the main coarse crushing plant, located adjacent to the main shaft, could only handle ore up to 12-in. size. This necessitated the installation of a 42-in. gyratory crusher as a pit primary crushing plant. The location of the pit ore bodies is on the south side of the Inspiration ridge, and the main treatment plants are on the north side of the Inspiration ridge. By making a heavy cut through a saddle in this ridge, the main haulage road was constructed, continuing the 7-percent uphill grade until it arrived at the pit primary crushing plant. From this point the ore is conveyed to storage bins and, from the storage bins, railroad cars haul to the main shaft coarse crusher. Trucks of 24 net tons' capacity, powered by large-sized Diesel engines, negotiate this 7-percent grade at approximately 9 mph.

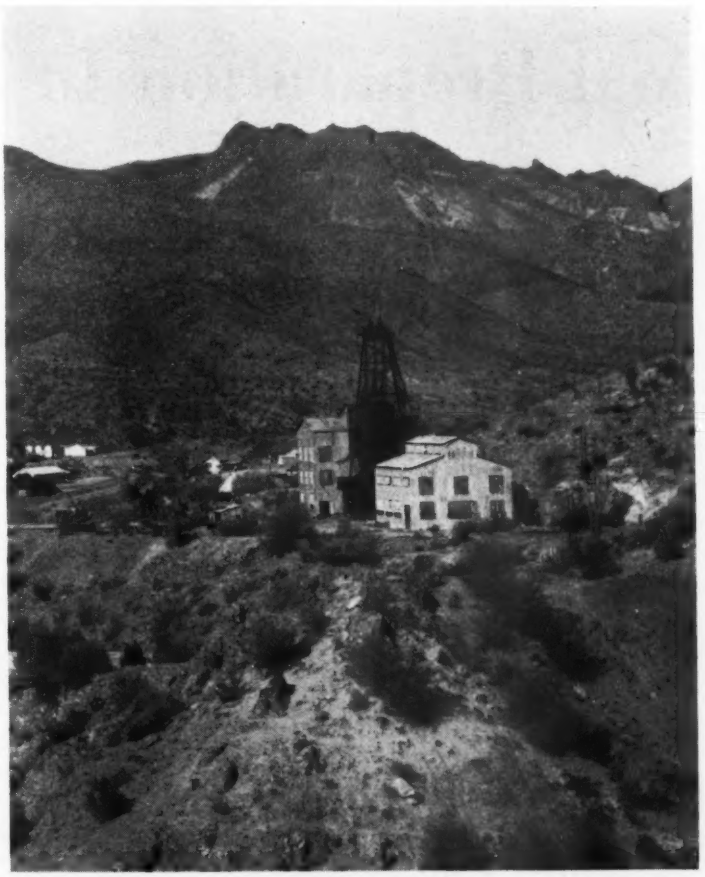
Kennecott-Ray—At the Ray Mines Division of the Kennecott Copper Corp. it was necessary, before starting stripping operations, to divert the flow of surface water in Copper Canyon which flows directly over the ore-body from west to east. This diversion was accomplished by cutting a channel and building a dam which will permit the seasonal flow of water to be discharged into another canyon outside the ore zone.

Practically most of the waste will contain some oxide and will be placed in areas where heap leaching can be practiced at a later date. The waste removal does not present a great problem at this property, as there are sufficient areas for disposal within a reasonable distance from the pit proper. Part of the waste will be placed in the caved area over section No. 2, part will be carried to the west, and part to the southeast. The maximum length of haul should be to the area toward the southeast, a distance of approximately one mile.

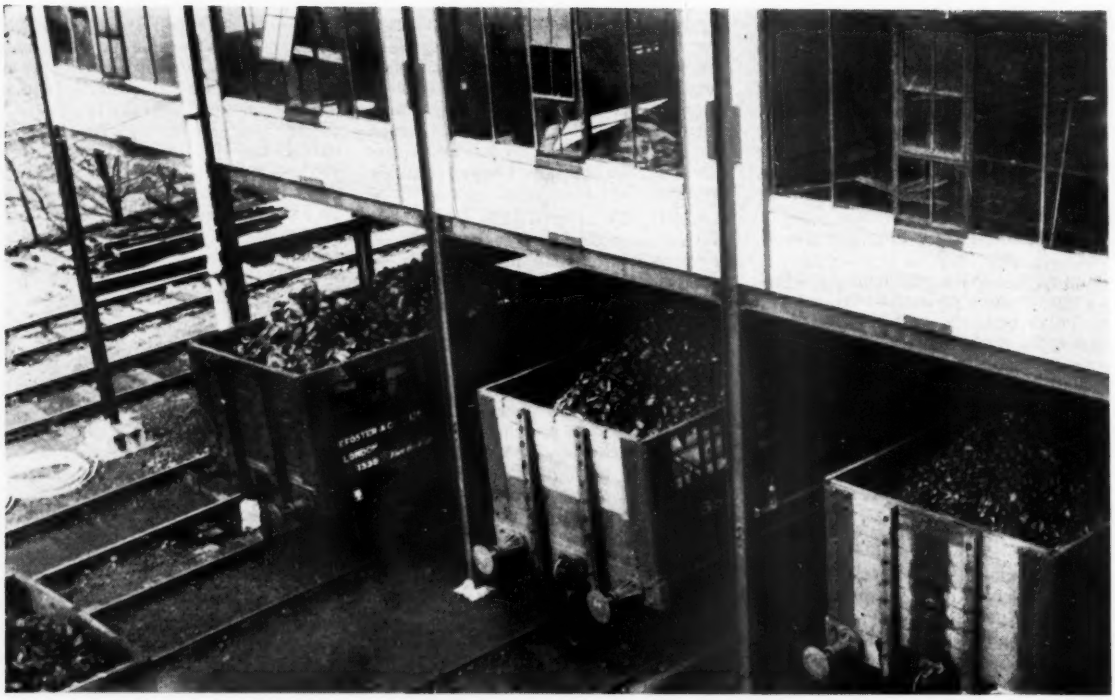
Nearly all the waste will be removed on a more or less level haul, with some up a slight grade. Ore, on the other hand, will be hauled almost entirely uphill. It is expected that the main body of ore will be encountered just below elevation 2100 and will continue to the bottom of the pit at elevation 1700. It is planned at present that roads for ore will be held to a maximum grade of 6 percent inside the pit proper and will be carried on 4 percent outside the pit limits. In order to crush pit material a jaw crusher will be installed close to the present crushing plant. This crusher will be of a size 60 by 84 in., and the 8-in. product from this crusher will be conveyed to the present coarse crushing plant where it will follow the same flow sheet as is followed by the underground ore.

Ray's present production is about 6000 tons per day and, as soon as maximum production is possible from the pit, it is planned to reduce underground tonnage, supplementing this with sufficient tonnage from the pit to make a combined production of 15,000 tons per day.

Appreciation is expressed to the respective managers of the three properties, E. R. Dickie, P. D. I. Honeyman and Robert W. Thomas, for their cooperation in furnishing data for the preparation of this article.



Ray open-pit ore will supplement underground production



Sized coal loaded for market

Coal Preparation In Britain

Mechanical Mining of Inferior Coal Spurs Washing Plant Construction

By ARTHUR GROUNDS
Chief Coal Preparation Engineer
National Coal Board
London

IN GENERAL the problems of coal preparation are identical in both Britain and America. Variations in practice arise either from the nature of the coal as mined, from considerations of national economy, from differences in mining practice, from differences in legislation in the two countries, or from greater or less progress and inventiveness in the science and art of preparation.

Like you in America, we in Britain are only two well aware of the effect of intensive underground mechanization on the quality of the coal sent up to the surface. The miner cutting and loading coal by hand could exercise a certain amount of discrimination and could throw back dirt or rock into the goaf, sending up raw coal containing only, perhaps, 10 percent of free stone. The machine loader shows no such discrimination and coal and stone are often sent up together, with the result that the run-of-mine coal may contain an average of about 20 percent of stone, although this figure may increase to 40 percent in certain circumstances. Not only has the proportion of stone increased in the raw coal, but mechanical methods of cutting have led to the production of a much higher proportion of fines. Fines throw a still heavier load on the preparation plants, both technically and financially, since it is well-known that the cost per ton for treating fine coal is much higher than the cost of washing the larger sizes.

In Britain, up to the year 1935, the increase in mechanical cutting and conveying was accompanied by a corresponding increase in the number of preparation plants installed, so that steady deterioration in the over-all quality of the coal as mined was accompanied by an increase in the facilities for dealing with the extra stone and fines. From 1935 onwards, however, mechanical cutting and conveying has increased at a steady pace, even during the period of World War II. The building of coal preparation plants, on the other hand, slowed down after 1935 and during the war years came almost to a standstill, as the materials and labor required for their construction were devoted almost entirely to armament production. Whereas the percentage of coal cut by mechanical means has increased from about 52 percent (in 1935) to over 80 percent in 1948, and the proportion mechanically conveyed has increased from about 42 percent (in 1935) to nearly 80 percent in 1948, the percentage of coal mechanically cleaned only increased from 41 percent to 48 percent in the same period. It is this large gap which the National Coal Board now has to close.

Low Quality of Coal Complicates Treatment

But mechanization was not the only cause of deterioration in the quality of British raw coal. Since 1935, many seams of coal of high quality have become exhausted. We are now being

faced with the mining of inferior seams, containing not only a higher inherent ash in the true coal substance, but also containing dirt bands and a much higher proportion of "middlings," interstratified coal-and-dirt or bone coal.

It will be appreciated that a relatively simple type of washer, which would give good separations on the excellent coals previously mined, may be by no means a suitable tool for dealing with the more complex coals now being produced. This change of quality has been one of the principal factors in the decision to adopt dense-medium processes in modern plants. Another factor has been the difficulty in dealing with the greatly increased proportion of dirt in the larger sizes of coal. To isolate this dirt on picking belts, much larger numbers of operatives would have been required, whereas, in actual fact, fewer operatives than ever are now available. Much of this work was done by boys, who have begun to realize that this is in the nature of a "blind-alley" occupation and are now seeking more remunerative work or work presenting more opportunity for advancement. Again, the school-leaving-age has been raised in Britain so that boys who might normally have taken up this work have stayed on at school.

A further difficulty lies in the fact that the increased quantity of dirt made it impossible for existing workers to select all the dirt in the time available, with consequent deterioration in the quality of the so-called "clean coal." Hand-cleaning, too, is much more costly than mechanical cleaning and it is thus easy to understand why dense-medium processes which can clean, by mechanical means, coal up to eight inches in size or even larger, have been adopted so enthusiastically, especially since they eliminate the human element and depend on physical processes.

In past years, there was much insensate competition between colliery companies and coal was frequently washed down to an unnecessarily low ash content in an endeavor to capture a particular market. By so doing, much valuable coal was allowed to go to the dirt tip with the shale. With the dense-medium type of plant, however, coal of low ash content can be produced, if required, without the loss mentioned above being encountered, since middlings can be produced at the same time. These middlings may either be crushed (if suitable) for the release of more clean coal by rewashing, or they may be crushed and used direct as boiler fuel. Economic questions of this sort which affect decisions as to the type of preparation plant to be installed and as to the specific gravity or gravities at which the cut or cuts should be made in order to satisfy market requirements and to give maximum profitability are now being studied more carefully than ever.

Wet Methods Preferred

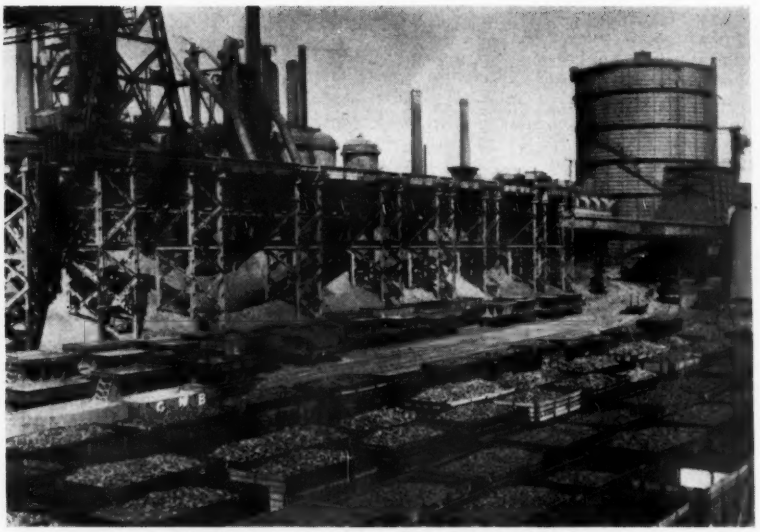
In certain parts of the country where first-quality gas coals are produced, dry cleaning has been extremely popular in the past and many dry cleaning plants were built between 1920 and 1935. To combat silicosis and pneumoconiosis, however, increasing use is being made of dust-suppresion measures underground such as water-infusion, wet spraying and so on. The result is that increasing quantities of coal are coming out of the pit with so much moisture that de-dusting and even screening out of the smaller sizes are quite impossible. Accordingly, it seems highly probable that there will be a decline in the use of dry cleaning methods, especially since dry cleaning is never so efficient as wet washing. This change in conditions has led to the coal and gas industries being compelled to study the use of wet-washed coal in gas retorts, with the attendant problems of free-flow in bunkers, design of chutes and so on.

Coppee Baum washery at Brookhouse Colliery, Sheffield, England

Drained wash boxes show float mechanism of shale discharge gear in a British washery

Where the small coal is relatively low in ash content, as, for example, where the coal is much more friable than the shale, thermal drying of, say, the coal below three-quarters of an inch in size may be practiced in order to enable the ¼-in by 0 smalls to be screened out, which would be impossible in the moist condition. Alternatively, hot-air de-dusting, using a Lessing de-duster, may be practiced, in which case the Lessing tube acts essentially as a flash dryer. The small coal so treated and screened out may be sold either as boiler fuel or for combustion in rotary cement kilns.

The river pollution laws in Britain are being tightened up, and it is there-



Adjoining iron, gas, and steel plants in South Wales

fore essential that dirty effluents from coal preparation plants should not be allowed to escape into rivers, streams or tidal waters. With the present shortage of labor, the previous practice of running slurry into settling ponds, allowing the solids to settle and then digging them out, cannot be carried out at many collieries. In addition, the fuel so recovered is so small in size and so high in ash content that it is quite unsuitable for fuel, even under colliery boilers. Boiler firemen object strongly to the arduous work involved in feeding such wet, sticky fuel to the grates and even more strongly to the hot, heavy work involved in frequent cleaning of the fires in shell-type boilers because of the high ash content of the fuel. Flue-cleaning is costly, and boiler efficiency is low, as is boiler capacity.

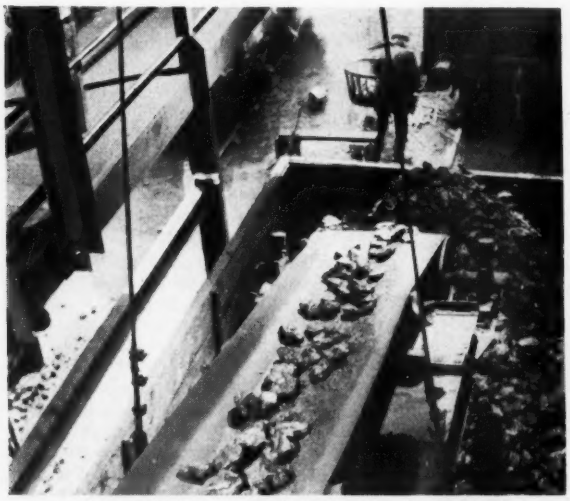
In view of all these disadvantages, we are installing large numbers of froth-flotation plants, making considerable use of the Denver Sub-A cells. In this way, we obtain clean fines which, in the form of filter-cake, are either blended with the washed small coal as, for example for carbonizing at coke-ovens, or, as in a new installation in the North of England, are still further dried in a flash dryer for use as pulverized fuel. The tailings from the cells are flocculated and thickened. The thickened tailings are, at some collieries, pumped by means of a diaphragm pump on to the dirt heap where the liquor gradually drains through the heap. We are now, however, installing two Bird centrifuges with the object of mixing the centrifuged tailings with crushed large dirt for pneumatic stowage underground. Where the ash content of the coal fines is sufficiently low, of course, flocculation only of the fines is carried out, the flocculated product being filtered and the filter-cake being mixed with the washed smalls or used as colliery boiler fuel.

Thermal drying is not practiced to any great extent in Britain as the winters are comparatively mild and frozen carloads of coal are almost unknown. Neither do we use dust-proofing as the average English house has an outside coal-store to which the coal is delivered either in bulk or in sacks containing one hundredweight of 112-lb.

Preparation Processes

The general trend in Britain now is to use a combination of dense-medium washing for the coal from eight inches down to, say one inch in size, Baum Jigs for washing the coal from one inch down to half-a-millimeter in size and froth flotation for the fines or size below half-a-millimeter. In this way we obtain the best yield from the point of view of profitability, with great flexibility as to throughput and quality for the large and graded sizes, and with a completely closed cycle and no effluent.

The dense-medium processes available in Britain are the Chance (15 plants), the Barvoys, operating on a suspension of barite and clay (14 plants) the Tromp, operating on magnetite, mill-scale or spathic iron ore suspensions (3 plants) and the Ridley-Scholes process, also operating on mill-scale, iron ore or magnetite (2 plants). The Link-Belt separator and the Cyanamid cone are now being exploited in Britain by Nortons (Tividale) Ltd. and it is hoped that this method, too, will be tried out before long.

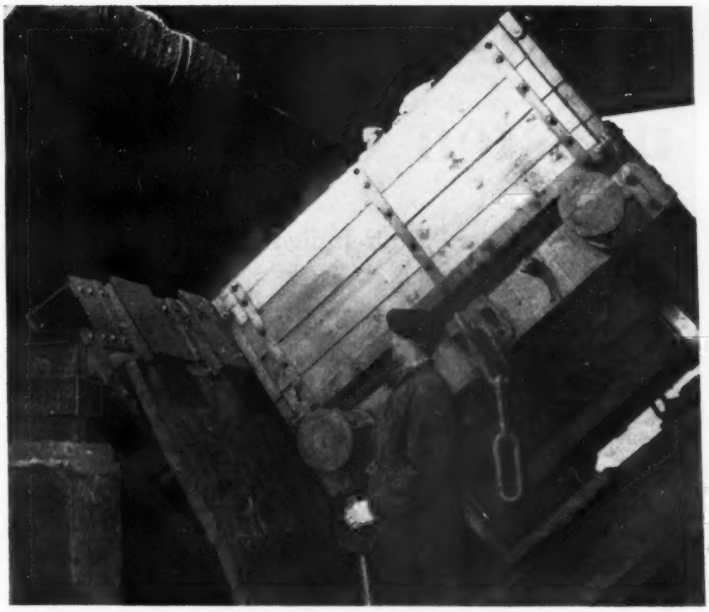


Loading washed coal at Lady Windsor Colliery, Ynysybyl, South Wales

Coal moves at rate of 150 tph in this British plant

In washing the smaller sizes the tendency is to swing away from trough washing in favor of using Baum jigs with fully automatic controls. In our experience, maintenance is lower on jigs than on troughs, and there is rather less breakage since recirculation for re-washing is not so pronounced as on trough washers. At the same time, we have 31 Rheolaveur trough plants and 18 Hoyois trough plants installed.

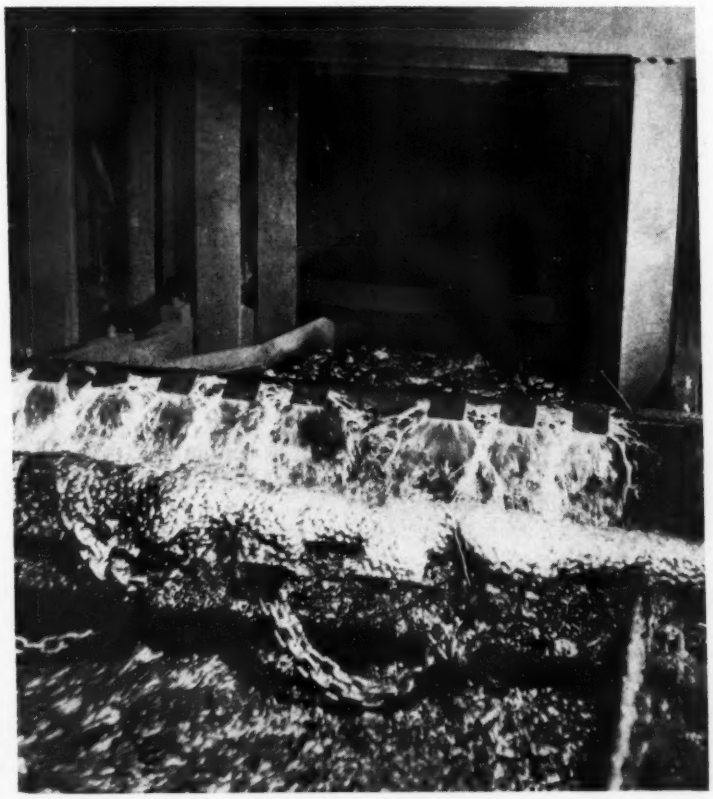
Architecturally, our coal preparation plant buildings have made enormous strides in the last 12 years, with ample admission of light and spaciousness without waste of space and without wasting money on unnecessary building. They are now designed to harmonize with other surface buildings and to present an appearance which does not offend the eye.



Dumping coal "wagons" at a South Wales washery

Organization for Production

From the point of view of organization, the country is divided into eight divisions, each of which has a divisional coal preparation engineer. The divisions are, in turn, divided into areas, each controlled by an area general manager and in each of which there is, or will be, an area coal preparation engineer who controls all the preparation plants in the area. Regular meetings are held, attended by all the divisional engineers under the chairmanship of the author, at which problems are tabled and discussed and experiences exchanged. In this way any new developments are quickly made known throughout the whole country in far less time than was possible before Nationalization. The divisional engineers pass on the information to their area engineers in the same way, so that knowledge of coal preparation problems, processes and plant is broadcast as quickly as possible. Working parties or committees of these engineers are deputed to make special studies of such subjects as standardization of plant, cleaning of fine coals, cleaning of large and graded coals, screening, crushing and breaking, dewatering, conditions of sale, etc. and to carry out research on these problems on the industrial scale. Fundamental physical and chemical research is carried out at the central research establishment at Stoke Orchard in Gloucestershire.



British coal on way to screens

Finally, contact is maintained by means of visits and correspondence with coal preparation engineers all over the world, and here the author would like to express his great appreciation of and gratitude for the willing cooperation which he has always received from American engineers and for all the trouble which they have taken to keep him informed of new developments and to furnish him with data on operations to enable him to form an opinion on processes unknown or little-known in Britain. In return, he would welcome inquiries from the United States and would be only too happy to do anything which will encourage or bring about that interchange of information and experience which can only prove beneficial to both our countries.

Rock Drilling Experience With Tungsten Carbide Bits

Accumulated Data Indicate Economies

By BLAIR BURWELL
President
Mineral Engineering Co.

ALTHOUGH THE interesting possibilities of a fundamental improvement in rock drilling methods by the use of tungsten carbide inserts in rock bits has been under extensive development in this country for the past three years, the general acceptance of this new tool has been slow. In contrast, European reports indicate that tungsten carbide drill bits are replacing standard drilling methods in many important mines and that substantial economies are being realized by their use.

The technical advantages of a percussive rock drill bit which could hold its gauge while drilling more than 100 ft of hole has been obvious since the first announcement of the new development. The possibilities of using light drills with less air and drilling at greater speed also promised a basic improvement in drilling methods, and indicated that an answer to the need for relieving the heavy labor of conventional rock drilling might be found.

Experience with the new bits has demonstrated that the introduction of a tungsten carbide cutting edge to a rock drill bit involves much more than a simple substitution of a carbide tipped bit for a steel bit. Although substantial progress is being made, it is apparent that an eventual redesign of rock drills, drill feeds, and bit attachments to fit the special qualities of tungsten carbide cutting edges will be required before the full advantages of tungsten carbide bits can be realized.

The fact that American rock drills have reached a high degree of mechanical perfection for drilling short holes of relatively large diameter with steel bits has made it difficult to introduce quickly a new and entirely different drilling tool involving substantial changes in rock drill design. Therefore the initial work on tungsten carbide bits in this country has consisted of the attempted adaption of European development to our more powerful rock drilling machines and larger and heavier drill assemblies. As a result, and particularly in the early stages of the development, the strength and hardness of the sintered tungsten carbide, the strength of the method of holding the insert, and the strength of the drill connections have all been too near the failure point to enable consistent performance in all types of drilling. Spectacular results in drilling hard rock with initial test lots of tungsten carbide bits have often been followed by erratic performance, insert breakage, and drill thread failure.

European progress has been characterized by use of the tungsten carbide cutting edges in small diameter bits used in light machines designed with a light blow and fast rotation. Apparently, the most successful use has resulted from types of drills where the cutting edge is attached directly into the end of alloy drill steel. With this design, the failure of threaded joints is avoided, as well as the necessity of the larger diameter of drill steel and bit required for threaded connections. The fact that European mining development is literally "starting from scratch" after

Experimental boom jumbo on trial in Canada

the war has greatly assisted their progress in the use of the new drilling edge. In addition, the use of a small diameter bit has aided solution of the problem of insert attachment.

American tungsten carbide bit manufacturers have greatly improved the type of insert and the method of holding it in the bit since the start of this work, so that the strength factors of the inserts in relatively large diameter bits are now satisfactory, under favorable conditions, for use in heavy drills and drilling machines; and are being developed for wagon type drills in large sizes.

Long European Experience

It is of interest to note that tungsten carbide tipped drills were successfully used in Germany ten years ago. In 1939, at the Friedlicher and Dansenbaum Mines, from 420 to 540 ft of drill hole were obtained per drill

European-type integral drill rod and bit after drilling 156 ft in hard granite and tactite

bit in hard conglomeritic sandstone, drilling holes of 1.8 in. diam. Light drills were found necessary to avoid shattering of tungsten carbide inserts, and efforts to use the inserts in combination with detachable bits were less satisfactory than when the inserts were mounted directly in the ends of drill rods. During the war, the development of tungsten carbide bits continued in spite of a shortage of tungsten.

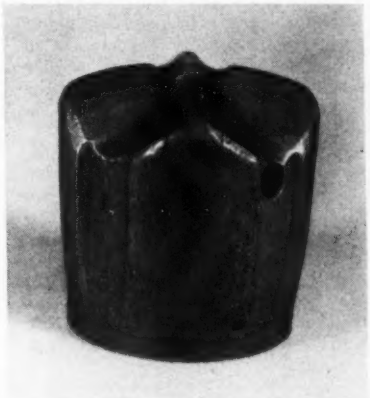
War-captured records indicated the use of tungsten carbide for rock drilling increased and was established as a regular drilling tool in a number of important German mines. At the Rammelsberg Mine at Gosler, tungsten carbide bits were in steady use; and 30 percent of all footage drilled in 1942 was done with hard metal bits. It was reported that from 564-750 ft were drilled per bit. At this mine the tungsten carbide inserts are mounted at the mine shops in the upset and slotted ends of drill steel. A chisel bit of a diameter approximately 1⅝ in. was described as being particularly satisfactory because it enabled the use of small explosive sticks and a minimum size of drill hole.

An important early observation made at this mine was that the negligible loss of gauge from wear of the reaming edges of the bits made it possible to have a hole of uniform diameter and to use explosive cartridges whose diameter was slightly less than the diameter of the hole. In this manner, it was noted that complete detonation was effected and that an economy in the use of explosives was obtained.

Swedish developments reflected the German developments insofar as they emphasized the factors of small holes, light drills, and avoidance of threaded joints. One of the most successful Swedish tungsten carbide bits was introduced about five years ago by the Sandvik Steel Works, and has gained wide acceptance in Europe and South Africa. This bit (known as the Coromant) consists of a sintered tungsten carbide insert brazed into a slot in the bit which is forged from the drill rod end. The bit is a chisel type of an average diameter of approximately 1⅝ in., and the drill rods are usually alloy steel (C 0.97 percent, Si 0.20 percent, Mn 0.25 percent, Cr 1.15 percent, Mo 0.25 percent).

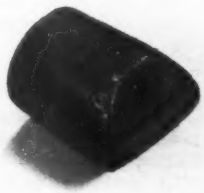
In general, European types of tungsten carbide bits have developed with a consistency of performance in all types of rock drilling machines that has not been noted in this country. The rock drills generally used with tungsten carbide bits weigh from 33 to 55 lb, with a piston diameter approximately 2 3/16 in. and stroke of 2⅝ in., using about 75 cfm. The pneumatic pusher type of mountings are favored. These are a hand-guided mounting of the jack leg type with a pneumatic feed.

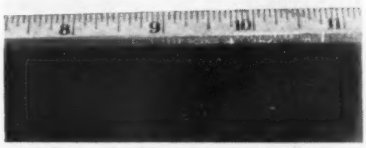
Two years ago, a test in this country with the Swedish type of Coromant drills in a light stoper drill gave a consistent performance and average of 350 ft of drilling per bit in abrasive sandstone, at a drilling speed of 29 in. per minute and a gauge loss of ¼ in. in the life of the bit. The normal experience in this rock was 6 ft per steel drill bit per sharpening and a total life of 30 ft, with an average drilling speed of 15 in. per minute. The principal observation in this test was that consistent results were obtained from all the drill bits tested in stopers,



A Timken bit that drilled 331 ft at rate of 153 in. per min in chalcopyrite, argillite and tetrahedrite

Carset Jackbit after drilling 307 ft in Barre granite





A Kennametal bit after drilling 950 ft at Iron River, Mich.

drifters, and jackhammers, and that the life of the insert, the alloy drill rod, and the shank were well proportioned to utilize the full drilling life of the sintered tungsten carbide.

The small chisel type bit with a slightly curved cutting edge tended to adjust itself to misalignment and edge contact and enabled satisfactory performance with the stoper drill.

Alignment Important

In order to obtain satisfactory use of a tungsten carbide bit with a relatively powerful rock drill, the alignment of the drill is important; and the use is limited to drills providing good alignment. If, however, the same bit is used in less powerful machines adapted to the tungsten carbide tool, the factor of safety in the strength of the carbide insert is sufficient to allow the consistent use in all types of drills.

This factor is reflected in comment on test data supplied by Climax, as follows:

"Particular attention must be paid to the alignment of drill steel and bits. Rock drills should be so constructed that alignment is as automatic as can possibly be made."

A summary of tests at Climax with four-point detachable tungsten carbide bits provides interesting information as to performance in several types of drills. Bits were 1½ in. in diameter, and were used under widely varying mine conditions.

	Average Life	Average Drilling Speed	Average Gauge Loss
Drifter	271.8 ft	1.59 fpm	.00047 in. per ft
Stoper	105.2 ft	1.40 fpm	.00126 in. per ft

Recent test work at the Balmat Mine of St. Joseph Lead Co. brings the following comment from R. J. Mechin, division manager:

"We have had an improvement in being able for the first time to get decent footage and life out of carbide bits when using a stoper drill. The only stoper we have been able to do this with, however, is a 60-lb experimental stoper with a very fast rotation."

The results obtained with good alignment and light drills with four-point bits often approaches the phenomenal. In prospect drilling for uranium ores, in abrasive conglomeritic sandstone, at the Cactus Rat Mine in Utah, drilling is done by a wagon-type drill using a 65-lb machine, consuming 100 cfm. Bits are the four-point detachable type of 1½ in. diam, used on alloy drill rods.

The following tabulation of results is available:

No. of Holes	Average Depth	Total Footage	Footage per Bit	Breakage
220	18	3960	1320	none

In this same mine and rock, average drilling life of a steel bit was 30 ft total and 6 ft per resharpening. The carbide bits were not resharpened. However, in the same rock, the life of tungsten carbide bits when used in drifters and jackhammers was approximately one-third the life of the same bit used in the wagon drill. Recent reports by manufacturers on successful tests of large size tungsten carbide bits in large wagon drills emphasize this basic relation of alignment and controlled feed in the life of a tungsten carbide bit.

Experience continued to emphasize, however, that only the drilling of small holes with light drills can be done without exceeding factors of safety necessary for all types of drills in all drilling conditions. In the application of small-hole drilling to mining, some interesting and valuable information is now developing which is not directly related to the technique nor costs of making the hole. This relates to use of explosives in the drill hole.

Blasting Economies

Our American custom and thinking has usually been to get most of the explosives in the bottom of the hole. Large diameter holes have been customarily favored by the rule-of-the-thumb miner for this reason. It now appears that this custom deserves a critical and engineering appraisal. The indications are that substantial savings of explosive costs, with equal or superior fragmentation, are possible with small diameter blast holes.

In diamond-drill blast hole work where holes of less than 1⅜ in. diam are detonated with Primacord, the breakage has been satisfactory in hard rock. In the same mine and same rock, holes of large-bottom diameter were deemed necessary for breakage when drilled by standard percussive drilling methods.

After overcoming the initial objection of miners to small holes, it was found that more consistent breakage and footage per round were obtained with small holes than with large holes; and a substantial saving in explosive use resulted.

C. J. Abrams of Climax Molybdenum Co. comments as follows:

"We definitely found by volumetric measure and count that we had a saving of between 25 and 30 percent in powder consumption; also that we had about the equivalent fragmentation with the less amount of powder and that the round broke better with the small holes in which the powder was better tamped.

"We are of the opinion that, with the small hole, the powder and tamping stick are more nearly the size of the hole, with the result that much better tamping is obtained, there are less paper wads between sticks of powder, and less chance of air pockets between loads—all of these result in better breakage and fragmentation."

It is indicated that explosives of higher strength and smaller diameters to fit small drill holes should be used in place of bulk-type powders often used for the physical filling of over-large drill holes. Attention is also called to drill-hole detonation factors by this experience in small-hole blasting. The savings effected in cost and the increased efficiency of explosives which are now suggested by recent small-hole drilling may be one of the more important contributions of the tungsten carbide bit to improvements in mine drilling practice.

Bit Connection Problems

On the subject of bit connections and detachable bits, American experience gives the widest difference of opinion. Some manufacturers who have committeed themselves to the development of tungsten carbide inserts to detachable bits have made splendid progress in the use of these bits in drills of a type where good alignment can be provided. But opinion among manufacturers as to the most satisfactory type of bit connection still differs widely. The experience and opinion of the mining industry using the bits is that the average threaded connection used with detachable bits is still far from satisfactory.

In order to utilize the full life of tungsten carbide cutting edges, alloy drill rods appear to be necessary. If alloy drill rods are used, either the insert must be mounted directly on the upset drill rod (European Coromant type); or a threaded or drive-on or welded connection must be provided. As threads are difficult to cut on suitable fatigue-resisting alloy steel, an intermediate member or connection is provided between the bit and the drill rod. So far, however, this operation requires above the average small mine drill shop equipment and control.

Where threaded detachable bits are designed to be used directly on threaded drill steel carbon drill steel is usually used due to threading problems of alloy steel. The lower life of carbon steel, with breakage of threaded joints, shanks, and rods have contributed to erratic performance in this case, as the joint is the weakest part of the assembly.

The attachment of the drill bit to the rod by welding (pressure welding) has much promise, and is under development.

The most serious objection to detachable bits is the relatively large diameter rods, joints, and bits necessary to make the threaded connections. This prevents obtaining the advantages of the small diameters so successful in nondetachable bits. The larger joints impede the removal of cuttings in free-drilling rock, and require higher water pressures to utilize the faster cutting qualities of the bit.

If the life of the carbide insert, the drill rod, and shank are developed to an equal point, the use of tungsten

SERVICE RECORDS

Type of Rock	Total Hole Drilled	Footage per Bit	Bit Cost per Foot of Tunnel
Granite	68,825 ft	128	$3.36
Sandstone	60,330 ft	428	.55
Sandstone & Granite	129,155 ft	190	2.36
All Rock	231,002 ft	295	1.05

Alloy drill rod life: 231 ft per rod.
Previous cost of steel bits: $2.43 average per foot of tunnel
Average advance per round: Steel bits—7 ft
Average advance per round: Tungsten carbide bits—9 ft
Average time of drilling 9-ft round with tungsten carbide bits: Same as time for 7-ft round with steel bits
Labor saving: Three shop men plus six men underground.

carbide bits would best be effected by the manufacture and sale of a complete drill rod and bit, factory attached for the life of the unit, as there would be no advantage to the user in the separate purchase of drill steel, drill connections, and tungsten carbide bits. The problem of service and distribution of such a tool, however, would be a difficult one.

Service Records

Recent results in this country in the use of tungsten carbide bits on difficult jobs show that much progress is being made where speed of drilling is essential, and where good alignment and good supervision is provided. Typical of this is the record of drilling at the Big Thompson Project Tunnel in Colorado, as furnished by John Austin, shown above.

In this tunnel, carbide bits with broken inserts from hard rock faces are reused in sandstone rock with good success. Bit diameters are 1½ in. and drills have 3½ in. piston diameter.

In the drilling of extremely hard or resistant rock with good alignment and good supervision, the outstanding performance of tungsten carbide bits has resulted in the recent conversion to tungsten carbide bits in a number of mines and quarries. The experiences with large-size tungsten carbide bits in diameter up to 5½ in., in wagon drills under controlled feed, is reported to average over 800 ft per bit in rock of a hardness sufficient to dull a standard steel bit in 10 ft.

Although a substantial amount of data is accumulating as to the performance of tungsten carbide bits with various types of machines in drilling all types of rock, the majority of the available data is not complete enough to justify a detailed tabulation or comparison at this time. New rock-drilling machines are being developed to use the superior qualities of tungsten carbide cutting edges, and much improvement is promised in uniformity of performance under all types of drilling and drilling machines. Work is under way on better bit and rod connections.

The following tabulation gives an approximation of average experience with tungsten carbide bits:

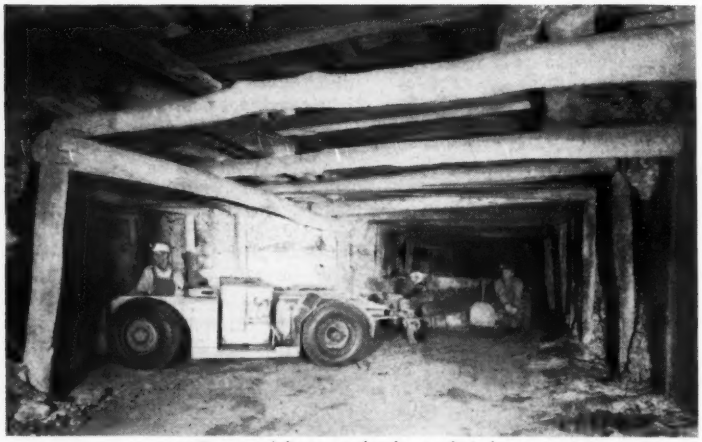
	Very Hard Rock	Hard Rock	Average Rock	Soft Rock
Life of Steel Bits.....	1 in. to 1 ft	1—4 ft	6—12 ft	30—60 ft
Life of Tungsten Carbide Bits.	8—100 ft	75—150 ft	150—350 ft	300—1300 ft
Drilling Speed—Tungsten Carbide. Inches per Minute....	10	14	16—24	24—30
Drilling Speed—Steel Inches per Minute.....	6	8	10—16	18—20

An important development is now under way in the use of hard-surfaced bits where tungsten carbide in various forms is welded on the cutting edges of conventional steel bits. Much of this work is in a preliminary stage, although the use of hard metal welded on the cutting and reaming of rock drill bits probably precedes the use of tugnsten carbide inserts.

Here the problem has been the bond between the steel of the bit and the welded metal as the use of surfaced bits in hard rock has tended to shatter and break the hard surface coating. By attention to the same factors which have proved essential to all around use of tungsten carbide insert bits: namely, small holes and light machines and by improvements in welding metal and heat treatment after welding, it is indicated that a satisfactory bit will be developed with drilling performance and cost, intermediate between standard steel bits and tungsten carbide insert bits. Successful use of bits of this type has been reported at the Bureau of Mines Experimental plant at Rifle, Colo. An improvement in the type of hard metal and method of use is giving encouraging results.

It is evident that the worth of tungsten carbide bits cannot be gauged by the relative cost of drilling holes per foot, in comparison with steel bits, because of other important related economies which are now indicated, such as better explosives use and lesser explosive costs, labor attendance, and reduced air consumption. The promise of a real advance in mine mechanization by drilling improvements is close to realization.

Long-feed Joy jumbo increased full-throttle head time with tungsten carbide bits



Tractor delivers trailer load of timber

By G. O. TARLETON
Vice-President
Consolidation Coal Co. (Ky.)

Tractors and Trailers For Supply Haulage

One Solution to the Problem of Transporting Men and Material in Trackless Mines

WITH THE introduction of trackless mining, although easing the task of coal haulage, there has been a tremendous increase in the problem of delivering men and supplies to the working face. The farther back from the face that trackless haulage is extended, the greater is the rate of increase of delivering difficulties.

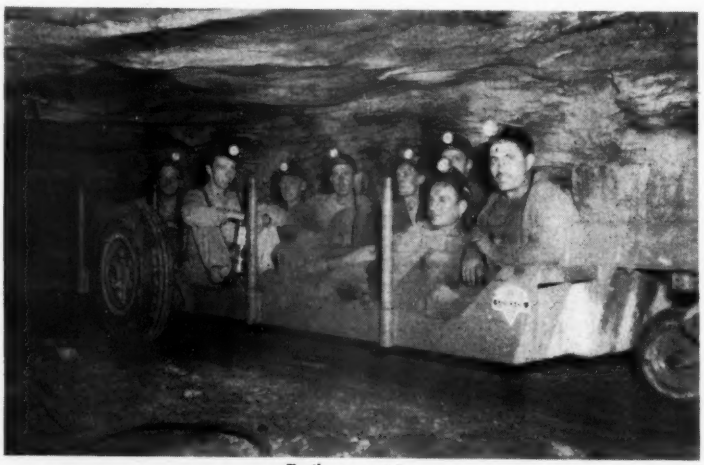
A second factor aggravating this problem of delivering supplies is thin coal. Unit loads are reduced materially and difficulties of handling are increased. Frequently, although not always, thin coal is the reason for using conveyors for the secondary, and possibly the entire main line haulage, to avoid taking bottom or top. From this it is easy to see how supply delivery expenses can skyrocket from the days of hand loading when the supplies a loader needed were placed in the mine car and delivered to his working place and he unloaded the material at no expense to the operator.

Supply Track Difficulties

When using belts and there is sufficient height, one always has the option of laying a supply track paralleling the belt. Although this track would cost substantially less than track for main line coal haulage, there is still a heavy outlay in material for rail, ties, switches, trolley wire and in labor for its installation and, in the case of room entries, for its recovery. All this equipment supplements the existing haulage facilities of the belt. Furthermore, the supply track will stop at the section supply station at the very closest, regardless of whether shuttle cars or conveyors are used for the face haulage. This involves a second handling of the material; unloading from the supply cars and delivering to the face. This requires expensive labor regardless of whether additional men are used or men drawn from productive labor at the face perform the task. For man-trips this layout is satisfactory provided that supply stations are moved forward each time the section moves.

Belt Reversal Hazardous

An alternative, generally forced on the operator by lack of height, is to use the belt itself to transport materials and men. In the case of materials of any appreciable size or quantity, this is expensive work and hazardous both to the supply crew and to the equipment. The belt must be run its entire length to make sure it is clear, then reversed and inched along while the materials are loaded on it. There must be men at the inby end to receive this material and unload it, generally with low clearance. An error of judgment in stopping or starting the belt could put a pan or crossbar into the tail piece, damaging the



Trailer man-trip

belt or injuring a man. Long material such as crossbars, conveyor pans, etc., also exerts a gouging effect on the belt at the idlers. This is bad enough where a single belt is used, but repeat this one or more times, which would be necessary with cross belt or multiple belt installations, and the situation becomes almost impossible.

In the end the supplies are at the section supply station and must be delivered to the face. During this procedure, there can be no loading of coal, a serious handicap in triple-shift operations. The transporting of men by belt is not too unsatisfactory. The necessity, however, of running the belt empty and stopping and starting while loading up the entire crew, maintaining certain minimum clearances, running at a reduced rate of speed and stopping and starting while unloading, certainly leaves the door open for better methods. In the case of multiple belts, this is even more true.

Conditions Govern Installation

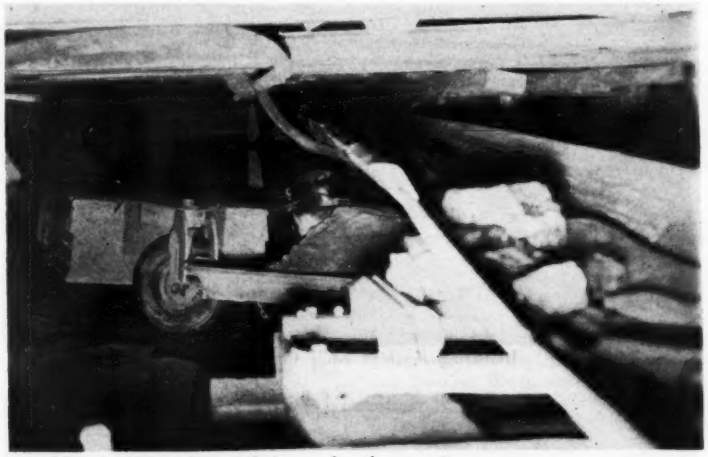
At the mines of Consolidation Coal Co. (Ky.) a wide variety of conditions had to be overcome so that each case has been a separate problem, which required that the man-trip and supply system be tailor-made. In many cases the use of tractors and trailers for transporting supplies or men, a portion or all of the distance, seems to be the better method.

With one exception all the mines have had the advantage of drift openings for supplies and they have shared the disadvantage of requiring medium to heavy cross-barring on the haulways and at the face. Beyond these conditions no similarity exists. Seam heights vary from 30 in. to over 100 in. Haulage systems range from all-belt through combinations of rail and belt to all-rail from the shuttle car discharge point. Duckbills or mobile loaders are used at the face.

When rubber-tired haulage was started the loading points were served by mine cars. Men and supplies were transported by rail to the section. Although this worked well as far as the men were concerned, timber supplies had to be taken to the face either by hand, causing the timbering to get behind, or by shuttle car, causing an interruption in production. The use of timbering machines to bring about savings in labor for timber setting also opened the door for savings in supply delivery. The Baker timbering machine is used in conjunction with a rubber-tired trailer designed and manufactured by J. H. Fletcher & Co.

Trailer Designed for Low Coal

The trailer bed is supported on two pneumatic wheels, 30-in. in diameter, which carry the load and can be steered manually by the timber helper. On the front end is a single pneumatic caster-type wheel of 16-in. diam. Originally this caster could be locked to provide automatic steering while pulling a train of trailers behind a tractor, each unit following in the tracks of the one in front.



Going under the pan line

With 12-ft wide entries, 90-deg turns could be successfully negotiated. In use at the face with the timbering machine, it was found that when backing up, the automatic steering device was not too effective and the manual steer was substituted. Recent improvements in the trailer now provide a combination of automatic and manual steering which permits a train of trailers to be pulled in and one or more dropped off at each section. There the timber crews pick them up one at a time and switch to manual steering for use at the face.

Our trailers were designed 6 ft 6 in. wide at the carrying wheels, with a 14 ft 4 in. over-all length from coupling to end of bed. Maximum height is 30 in., exclusive of load or standards with 7 in. road clearance. The trailer bed is 48¾ in. wide, 11 ft 3 in. long and 10⅛ in. from the bottom. This permits carrying crossbars up to 18 ft in length.

Face Supplying Eliminated

All timbering supplies needed by the timber crew are loaded on the trailer at the supply point—crossbars, posts, cap blocks, wedges and cribbing—in the correct proportion. With the supply trailer attached to the timbering machine, delivery at the face, when needed and not before, where they would be in the way, becomes automatic, with no stopping of production or extra labor. The trailer can be loaded by the timber crew if they are not too heavily pushed, or by the supply crew delivering the timber, if the section requires more than normal timbering. Thus the system gives a certain amount of flexibility.

Here again, however, the opportunity is presented for further savings, inasmuch as the unloading of timber from the supply cars and its subsequent reloading on the trailer, one piece at a time, is wasteful and unnecessary. At present the problem is being considered from two angles: one—carrier trucks to run on the rail, which would hold the trailer, loaded outside, without increasing its height too much. The loaded trailer would then be pulled off on the section and an empty one put in its place on the carrier truck.

The second approach is to "palletize" a unit timber package outside and place it on the supply car by means of suitable material handling equipment. On the section, it will be picked up by hoists and the empty trailer run under it to receive the package. Some companies have eliminated the pallet by systematically placing the timber on trucks in the timber yard. A satisfactory solution to this problem should put the supplies to where they are needed at a minimum cost, with a great reduction in the chances for accidents from handling heavy pieces of material.

Handling Supplies in Contour Mining

Contour mining has proved to be a natural for tractor-trailer supply methods. In July 1947 an opening was started in the No. 4 Elkhorn seam at Dunham, Ky., averaging 42 in. in height. Entries were projected to go 2400 ft, with the coal brought to the outside by belt conveyor, where it was loaded into mine cars and sent to the preparation plant. As there was no track equipment on hand that could operate in 42 in. coal, there was no question of laying a supply track paralleling the belt. It was decided to

maintain a roadway in the entry adjacent to the belt line and use trailers for transporting both men and supplies.

Tractors Require Good Bottom

To provide motive power for the trailers, a Baker mine tractor was purchased. The model has an over-all height of 32 in. with 6 in. road clearance. It operates on four pneumatic tires, two-wheel drive and two-wheel steer, three-point suspension. Power is supplied from a 450-amp, 48-v storage battery.

Like all rubber-tired equipment, the tractor will do much better on a hard, smooth bottom. The effort expended to maintain a good permanent roadway by using calcium chloride, scraping, filling ruts, draining or bridging mud holes is well worth the extra cost. With road resistance increasing 60 percent or more for a soft, loose roadbed over a reasonably good road, the decrease in power demand on the storage batteries, larger pay loads, and decreased maintenance cost on the equipment will justify the expense.

Although soft, muddy bottoms have always been the bane of rubber-tired equipment, where too prevalent to overcome, the addition of heavy-duty chains to the drive wheels of the tractor enables it to get around satisfactorily. Naturally, this will increase the power demand on the battery, requiring more frequent changes. Battery changes will vary with length of haul, load, grades and road conditions. Batteries should be checked closely until a definite change period has been established that allows a margin of safety. Then this schedule should be rigidly adhered to, to prevent damage to batteries and serious interruptions caused by batteries going dead back in the mine or being over-discharged.

Men were taken from the outside to the face on the same trailers which were used for supplies. Recent developments have produced a special man-trip trailer with two rows of seats back to back. Travel time with trailer man-trips was less than with the belt, chiefly because of stopping and starting the belt while loading and unloading, and, in our opinion, safer. If the coal had been discharged from the section into mine cars instead of on a belt, the all-rail haul would have been faster for man-trips.

In delivering supplies, especially timbers and other heavy items, the tractor-trailer demonstrated its full superiority. Crossbars and posts in the proper proportions were loaded by means of a fork-lift truck onto the trailers. These were pulled in trains to the section and unloaded at such face as needed, as no timbering machine is used in the mine. There was no heavy lifting, no rehandling, no interruption of the main line haulage. Face men were left strictly on face work and the material was placed where needed.

Supplying in Thin Seams

In the spring of 1948, with the opening of the Hill mine in a split of the No. 3 Elkhorn seam, the original plans called for supplying by means of tractor and trailers. In another series of contour openings, each set of entries had belt conveyor haulage to an outside track. Duckbill-equipped shaker conveyors are used at the face. Averaging 32 in. in height, the top turned out worse than expected, requiring cross-barring on 3-ft centers and header spans in the back entries had to be limited to 6 ft. This was both too low and too narrow for existing equipment, making it necessary to deliver all timber and other supplies over the belt.

At this time, J. H. Fletcher & Co. delivered a working model of the Trike, which they had designed and built at the suggestion of our company. This was designed as a supervisors' inspection car for low coal. Only 22 in. high, it was 36 in. wide and 9 ft long. On rubber tires, it has two drive wheels in front, steers through a single wheel at the rear and can turn in its own length. With contactor control, it has one speed in either direction. Two 162-amp, 20-v storage batteries supply power to 1½-hp permissible electric motor.

The ability of the Trike to pull through mud and over rough ground and to negotiate low and closely-timbered places, encouraged the management of the mine to test it further by designing a trailer for it. This was made from an old shaker pan and a pair of rubber-tired wheels and axle from a rock-dusting machine. By using this trailer to deliver headers, pans, cradles, belt extension parts and other sectional supplies, all supplying by belt has been eliminated. A further advantage, its low height, enables the Trike to pull its load under the pan lines at the drives or to cross over the pan lines closer to the face by means of a small ramp and filler block. This permits supplying to the swivels instead of to the end of the belt, releasing labor from dragging heavy material for coal production.

(*Continued on page* 45)

Timbering machine hauls timber supplies

Supply truck crosses pan line

Economic Mobilization and The Mineral Industry

In World War II Incongruous Regionalization Plans Hampered Production of Essential Materials

By DR. JOHN D. MORGAN, JR.*

IN WORLD WAR II the domestic mine production of many minerals reached a maximum in 1942 and then declined throughout the rest of the war, despite great unsatisfied demands for such materials. For example: Fig. 1 illustrates our wartime reliance upon imports for essential supplies of the highly strategic metals—copper, lead, and zinc. The decline in domestic mine production was attributable to many causes, most outstanding of which were manpower shortages, equipment shortages, and general administrative confusion.

The manpower shortage was the result of a prewar exodus from the mines to shipyards and to aeroplane factories, as well as the drafting of 126,000 miners and the enlistment of 17,000 miners from a total of 606,000 miner registrees. The equipment shortage was occasioned by the conversion of some mining machinery plants to the manufacture of war materiel, and by our Lend-Lease shipments of mining machinery to Canada, Great Britain, the USSR, and other United Nations. The general administrative confusion resulted from a lack of adequate prewar mobilization planning and from the overlapping spheres of jurisdiction of the many Federal and state agencies that were directly concerned with the domestic mineral industry.

In the mineral industry, production is a function of:

- Capital
- Developed reserves
- Mine plant and mineral preparation plant
- Maintenance, repair, and operating supplies
- Manpower
- Electric power
- Transportation
- Scientific research in exploration mining, and beneficiation.

To expand the production of essential minerals requires a coordinated expansion of varying proportions of all of the above elements. Likewise, to contract or limit the production of unessential minerals requires a coordinated reduction of all of the same elements. Indeed, simply to maintain a prewar rate of production during an emergency requires extensive coordinated planning involving all of the above elements. However, in World War II numerous Federal emergency agencies were superimposed on the several line agencies already dealing with mineral problems; each agency was concerned with one or more of the above elements, but few operated on an agreed-upon coordinated basis. Moreover, not only were numerous agencies involved, but each Federal one, finding that it could not successfully operate exclusively from headquarters at Washington, D. C., established regional areas of responsibility that were incongruous to the extreme. Fig. 2 lists some of the major Federal agencies dealing with the domestic mineral industry in World War II, and clearly shows the lack of congruity in their regionalization plans. In addition, Table I shows that there were numerous dissimilarities in the selections of regional headquarters.

Unrealistic regionalization of war agencies concerned with production, labor, power, price, administration, etc., seriously affected efficient mineral production during World War II. A suggestion for an effective plan with an appropriate degree of decentralization is offered here.

Administrative Complications

As an example, consider the XYZ Lead Mine in the Coeur d'Alene mining district of Idaho. Administratively, this lead mine was directly concerned with and was receiving instructions and assistance from:

- Region 13 of the War Production Board, with headquarters at Seattle, Wash.
- The Lead Section of the Tin-Lead Division of the War Production Board, with headquarters in Washington, D. C.
- The Spokane Region of the Mining Division, War Production Board, with headquarters at Spokane, Wash.
- Region 12 of the War Manpower Commission, with headquarters at San Francisco, Calif.
- Region 8 of the Office of Price Administration, with headquarters at San Francisco, Calif.
- The Western Division of the U. S. Bureau of Mines, with headquarters at Salt Lake City, Utah
- Local office of the U. S. Geological Survey at Spokane, Wash.
- Metals Reserve Co., office at Phillipsburg, Mont.
- 9th Service Command of the U. S. Army, with headquarters at Ft. Douglas, Utah
- The Idaho Bureau of Mines and Geology, with headquarters at Moscow, Idaho.

If the XYZ Lead Mine desired to increase its production, to whom did it turn for assistance with its equipment, labor, supplies, power, transportation, and other problems? Obviously, the mine administration would turn to all of the above and to some additional agencies shown on page —. Since a coordinated solution of these problems was usually impossible to obtain, the result was a decline in mine production.

Most of the World War II agencies described in Fig. 2 and Table I are now inactivated, but if an emergency were to occur in the near future, many of the existing plans might only duplicate the regional confusion of World War II. Today, even in peacetime, there are many state, educational, and Federal agencies directly concerned with mineral problems. For example, there are in California today:

- The Division of Mines, Department of Natural Resources, with headquarters at San Francisco and branches at Los Angeles, Sacramento, and Redding

* With the National Security Resources Board, Washington 25, D. C. Opinions are those of the author and do not necessarily reflect official views.

A Comparison of the Regional Headquarters Established by the Three Major War Agencies: War Manpower Commission, War Production Board, and Office of Price Administration

W. M. C.		W. P. B.		O. P. A.	
Region	City	Region	City	Region	City
1	Boston	1	Boston	1	Boston
2	New York	2	New York	2	New York
5	Cleveland	5	Cleveland	3	Cleveland
7	Atlanta	4	Atlanta	4	Atlanta
6	Chicago	6	Chicago	6	Chicago
10	Dallas	8	Dallas	5	Dallas
11	Denver	9	Denver	7	Denver
12	San Francisco	10	San Francisco	8	San Francisco
3	Philadelphia	3	Philadelphia		
9	Kansas City	7	Kansas City		
8	Minneapolis	12	Minneapolis		
4	Washington				
		11	Detroit		
		13	Seattle		

A Comparison of the Regional Headquarters Established by the Petroleum Administration for War, the Coal Mines Administration, and the U. S. Bureau of Mines

P. A. W.		C. M. A.		U. S. B. M.	
Region	City	Region	City	Region	City
2	Chicago	3	Chicago		
4	Denver	5	Denver		
1	New York				
3	Houston				
5	Los Angeles				
		1	Pittsburgh		
		2	Ashland		
		4	Kansas City		
				1	College Park
				2	Rolla
				3	Salt Lake City

Table I. Major regional headquarters established in World War II.

The Mining Section, Division of Industrial Safety, Department of Industrial Relations, with headquarters at San Francisco and a branch at Los Angeles

The Division of Oil and Gas, Department of Natural Resources, with headquarters at San Francisco and branches at Los Angeles, Santa Paula, Santa Maria, Bakersfield, Taft, Coalinga, and Long Beach

Local offices of the U. S. Bureau of Mines at Berkeley, Los Angeles, Redding, and San Francisco

Local offices of the U. S. Geological Survey at Bakersfield, Long Beach, Los Angeles, North Sacramento, Sacramento, San Francisco, Santa Barbara, and Taft.

All of these agencies are directly concerned with exploring and developing the mineral resources of California. In addition, there are in California nearly ten universities and colleges engaged in training and research activities in the mineral field. There is a similar multiplicity of such agencies in almost all mineral producing states. Based on previous experience, it may be assumed that there is insufficient coordination of their various activities.

Realistic Plan Advocated

It is obvious that no arbitrary regionalization plan will please all the regular peace-time Federal agencies, the war-time mobilization agencies, and the various state agencies. However, a single compromise regionalization plan, accepted by all, would be much more useful than ten or more overlapping incongruous improvisations. A future total war will undoubtedly require far greater decentralization of administrative responsibility than was in effect in World War II. Inasmuch as the domestic mineral industry must be assisted in peace-time through existing Federal and state agencies, and since it must be mobilized in war through the emergency agencies that will be established, there is a great need at this time to bring some order out of the

(*Continued on page* 43)

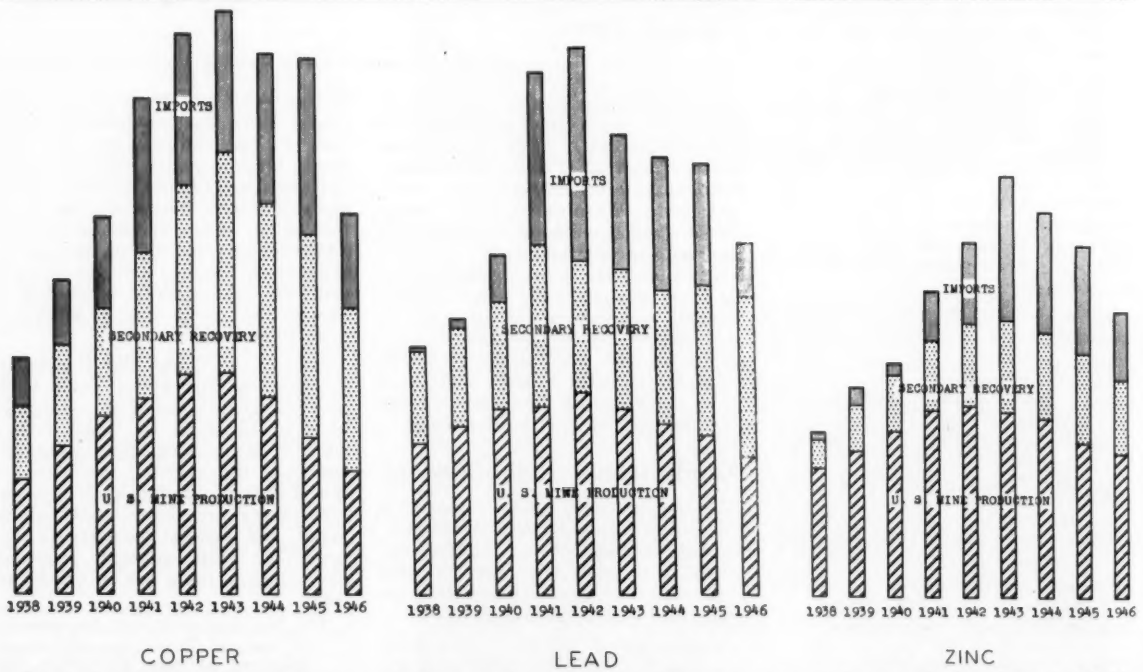
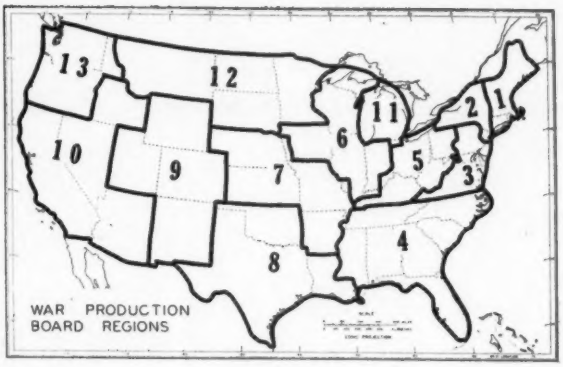
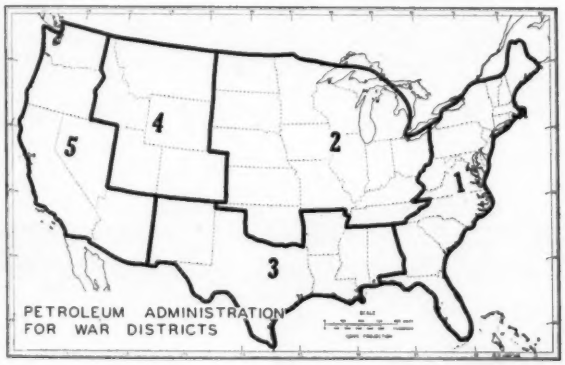
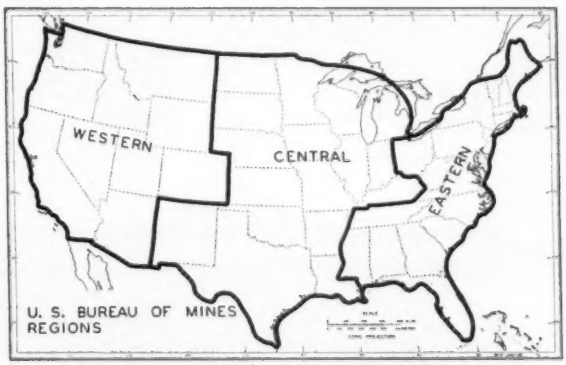
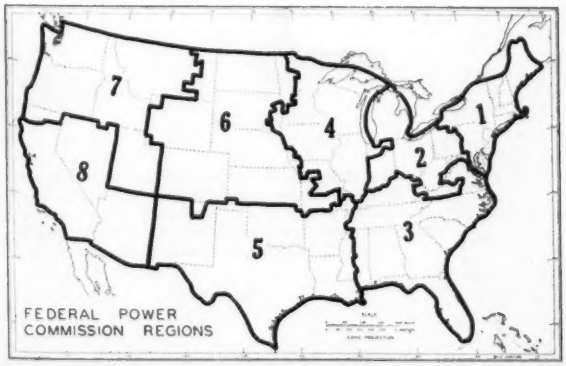


Fig. 1. A comparison of domestic mine production, secondary recovery, and imports as sources of copper, lead, and zinc in World War II. (A different vertical scale has been used for each metal.)









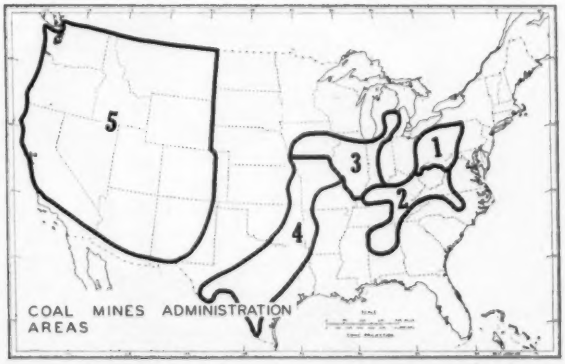


Fig. 2. A comparison of the regional boundaries of major Federal agencies dealing with the domestic mineral industry in World War II.

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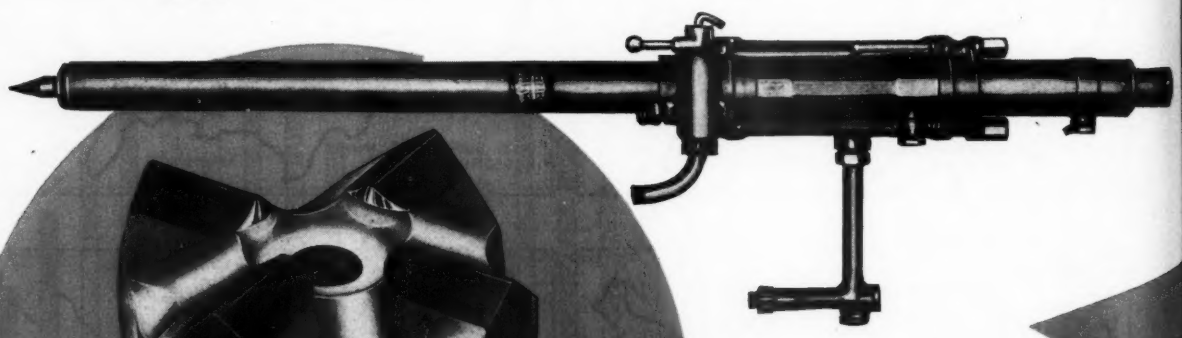

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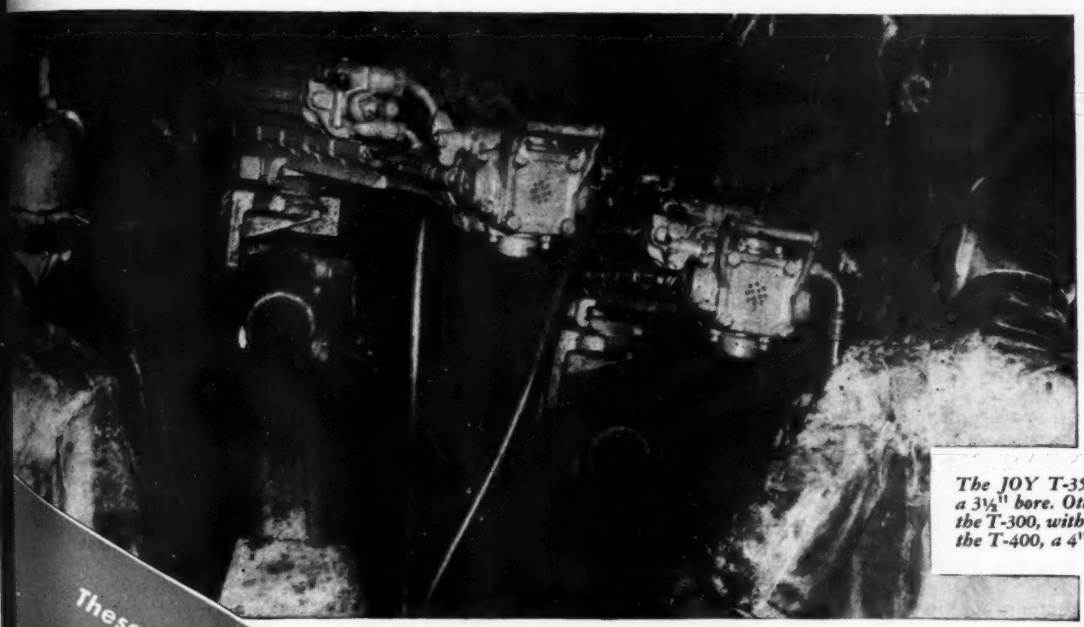

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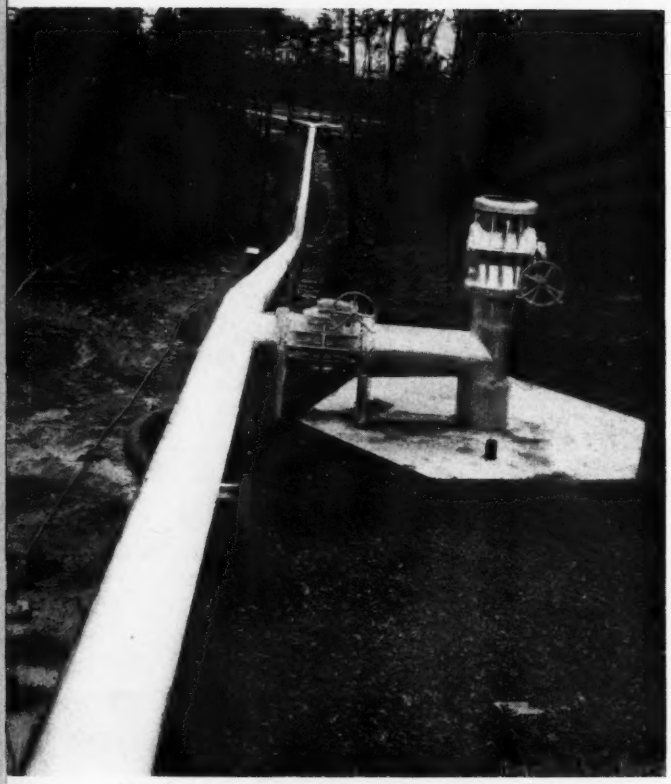


Pipe line for air from compressor to underground fire

Underground Gasification of Coal

By GEORGE T. BATOR
Associate Professor of Mining
University of Alabama

Second Experiment in Operation at Gorgas, Ala.

THE SECOND underground coal gasification experiment in the United States was fired on Friday, March 18, 1949, at Gorgas, Ala., and is now under way. Current tests are the result of many months of preparation based upon data obtained from the first operation that was carried on in 1946. Both experiments are conducted jointly by the Bureau of Mines and the Alabama Power Co. under a cooperative agreement resulting from the Synthetic Fuels Act of 1944. Under this agreement the Bureau of Mines supplies scientific, engineering, and economic information and the Alabama Power Co., visualizing the possibilities of gasification, provides resources and manpower to help develop this new source of synthetic fuel.

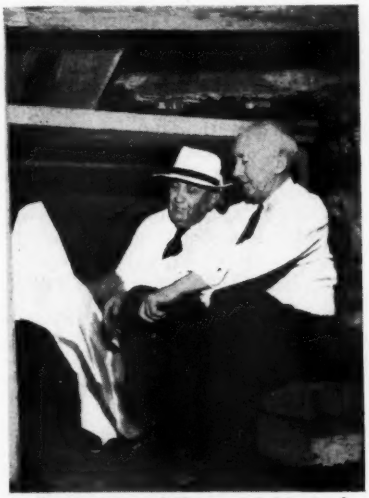
Synthetic liquid fuels can be made from three major raw materials—coal, oil shale, and natural gas. Of the three, coal is the largest of potential sources, and excluding fissionable materials, comprises more than 95 percent of our mineral fuel-energy reserves. Underground gasification, if practicable, has almost incredible potentialities for utilizing coal in place. Russia and Belgium have been investigating this source of fuel supply and carrying on experiments. Russia has reported the successful operation of several industrial installations although, since 1940, little information has been available on their progress. The Belgian project began in 1948 but results have not as yet been published.

First Experiment at Gorgas

Gorgas, Ala., was the selected site for the first underground gasification experiment in North America and it is here that the second large scale experiment is now being conducted. In order to obtain a true picture of this new venture a review of the first experiment is necessary.

Compressor house for air to underground

Approximately 400 tons of coal were consumed during a continuous 50-day burning period of a small area of coal in a 3½-acre peninsular tract. The seam is the Pratt which has a height of about 46 in. Two parallel entries separated by a 40-ft pillar were driven 150 ft and joined by a crosscut at their extremities. The pillar thus formed, 150 ft by 40 ft between the entries provided the block of coal for gasification. Large pipes were placed at each sealed



Milton H. Feis and Thomas W. Martin, key men in the project, discuss operations

entry portal to permit air intake and gas discharge; the pillar was ignited by thermite bombs dropped at the crosscut connecting the entries and burning progressed towards the portals. Thermocouples located at predetermined points indicated temperatures and short period tests were made using oxygen-enriched air and steam as in watergas production.

Results from this first experiment provided much information which showed the following: (1) that maintaining underground combustion was not a difficult problem; (2) that complete gasification could be obtained in the combustion zone with only ash and clinker remaining as residue; and (3) that high temperatures altered the overlying formation so that it became plastic or expanded in a manner similar to vesicular volcanic rock. This change in the rock was beneficial in that it replaced the burned-out space where the air and gas are directed along the gasification face. A power gas of variable Btu content was produced by various methods employed.

Second Project a Pilot Plant

These results indicated that underground gasification is feasible and warranted further experimentation. The apparent possibility of increased utilization of our coal reserves introduces further objectives for the large scale test, some of which are: to determine the amount of coal that can be gasified from an initial combustion zone, and the shape and extent of the area burned. It is most important to know the proper design of gas inlet and outlet ports, length of passageway, rate of gas flow, the effect of heat on overlying rock formation, the gas quality, the adaptability of equipment and many other important items.

Preparatory Work

Some 500,000 tons of coal have been blocked out for this experiment in an outcrop area of the Pratt seam where the maximum overburden exceeds 130

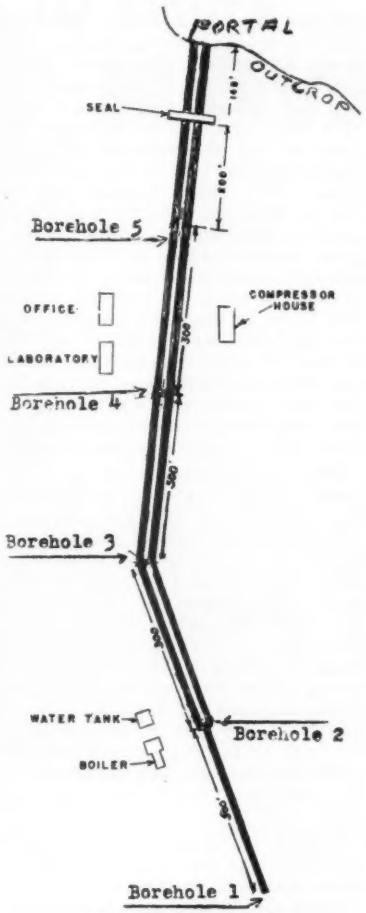


Fig. 1. Plan of entries

ft. This has been (what might be termed) "developed" by two parallel entries, with a 10-ft chain pillar,

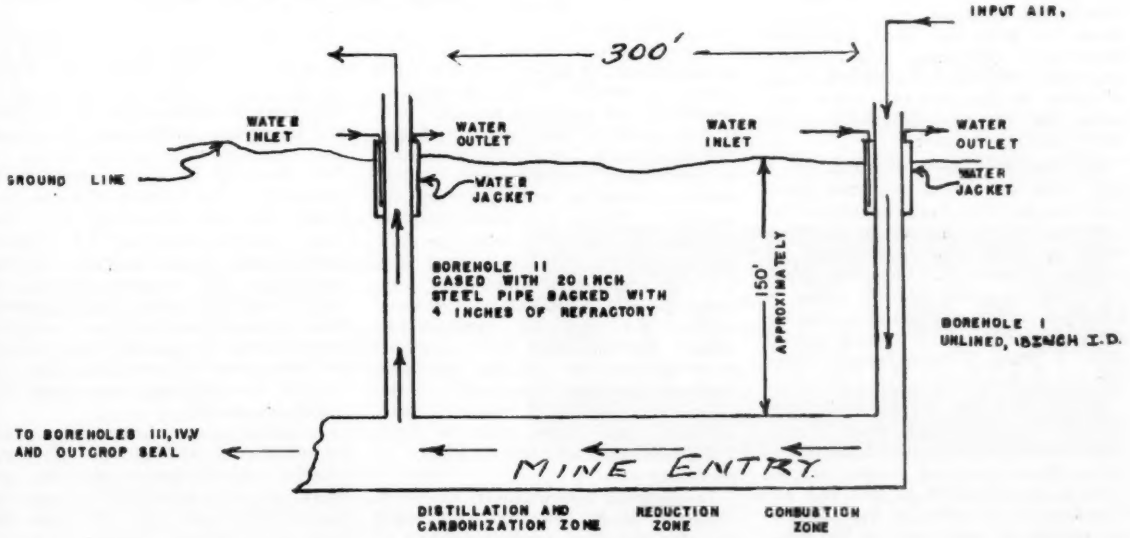


Fig. 2. Pipe and valve plan

driven 1200 ft with an additional 300-ft single entry to give an over-all length of 1500 ft. The entire plan is shown in Fig. 1. Five large diameter boreholes drilled into the entry will serve as air inlets and gas outlets for the underground passages. Holes number two, three, and four, from which the hot gases will be drawn, were drilled 28 in. in diameter and are fitted with 20 in. diam carbon pipe, surrounded by 4 in. of protective castable refractory cement. No lining is used in holes one and five, which are 18 in. in diameter, as these will be the cold air intakes. At the surface all five boreholes have identical concrete-sealed water jackets fitted with an internal water spray to help maintain a temperature of less than 800 F in the discharged gases.

Fig. 2 shows this cooling arrangement and the borehole connections to the underground openings, but does not include the firebrick walls at the bottom of the pipe in the mine entry which are intended to support roof and borehole openings. Throughout the combustion area, smaller holes w.th inserted thermocouples provide means to determine temperatures and extent of the burning area. Temperatures are expected to exceed 2600 F, but it is hoped that temperature control will be made possible either by employing variable volumes of air or by admitting steam into the air circuit.

It is, of course, a matter of primary importance to prevent the escape of gases through fissures that might exist in the strata overlying the coal. To prevent this, the strata adjacent to the large boreholes was pressure-grouted by four 6-in., churn-drill holes spaced 4 ft from the center point of each large hole. In all cases, the last two 6-in. holes refused to take grout although at several locations the first two holes consumed appreciable quantities; one of them requiring 300 bags of cement. Refusal of grout by the last two holes indicates that the underground crevices were securely stopped.

Ignition was made at hole No. 1 (the first air inlet) and the gases will escape into the atmosphere at hole No. 2. No provision has been made to utilize the power gas although it may eventually be piped to a nearby power plant. Gases of 300 Btu content can be distributed for short distances only, but after enrichment it could be economically piped for longer distances.

In the air piping arrangement, two valves are placed at each takeoff from the main air line to the boreholes thus providing means of reversing the direction of gas and air if desirable. A valve on the horizontal section of pipe controls the compressed air source with a valve on the vertical pipe allowing discharge of the gases to the atmosphere.

Air for the project will be provided through a 20-in. air line supplied by a reciprocating compressor rated at 7000 cfm at 30 psi. Auxiliary air supply consists of a low-pressure blower capable of 7000 cfm at 2 psi and a smaller blower of 1500 cfm at 10 psi. Steam will be generated by a 125-hp boiler.

Operational Plan

The ignition made on March 18 was at hole No. 1, at which point air is admitted. Gases will pass out to the surface through borehole No. 2. The remaining holes will be closed off for the time being, confining the first burning zone along the butt entry. But if high temperatures and low carbon monoxide content is obtained in the first 300-ft underground passage, the length will be increased and the gases emitted at hole No. 3. This arrangement of holes and air lines allows a variety of adjustments to determine the optimum results.

The quantity and quality of gas will be studied constantly by means of continuous recorders and by laboratory sampling and analyzing apparatus. Piping has been installed to take gas samples from the hole directly to the laboratory (see Fig. 1). In addition, a number of 6-in. holes have been drilled in a pattern around the projected combustion areas; thermocouples are placed in each of these holes at the coal level and are connected to recorders in the laboratory so that a constant check on the temperatures may be kept. This will indicate the progress of combustion.

In addition, the Southern Research Institute of Birmingham supervised the application of another method of determining the location of the fire areas. This consists of volatile materials placed in capsules in horizontal holes drilled into the coal seam in the ribs of the mine entry. These serve as tracers; when the capsule is reached by fire, it will volatilize and the resulting gas will be detected and recorded in the gas analysis.

Should the burning area become widespread, additional 18-in. air-supply boreholes will be strategically placed to propagate the gasification area and perhaps provide information which will determine the most effective spacing of entries for future gasification projects. This experiment will continue until the maximum information is obtained and will be followed by a quenching and cooling period and a thorough examination of the burned-out area. The afterburning examination should provide valuable information on the completeness of combustion and the temperature effects on overlying roof rock.

Laboratory and office, Gorgas Gasification Project

Bureau of Mines experts point out that there are millions of tons of coal which could readily be subjected to underground gasification, thus reducing the drain on the nation's oil and gas reserves. The latest figures on fuel reserves in the United States compiled by the Bureau of Mines conclude that coal comprises 95.5 percent, known petroleum 0.4 percent, and natural gas 0.4 percent. Of the remaining fuel reserve sources, oil shale amounts to more than 3 percent. The demand for coal has remained constant for the past 30 years, whereas petroleum consumption has increased five-fold and natural gas demand seven-fold.

It will be months before this second experiment will provide all data sought, but the men responsible are most optimistic about its outcome and believe that this test will open the way for profitable commercial gasification in the near future.

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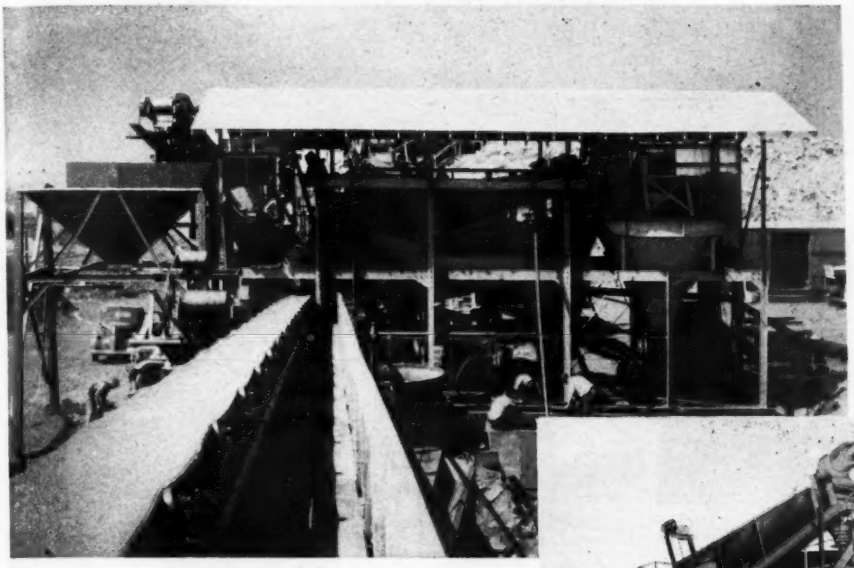

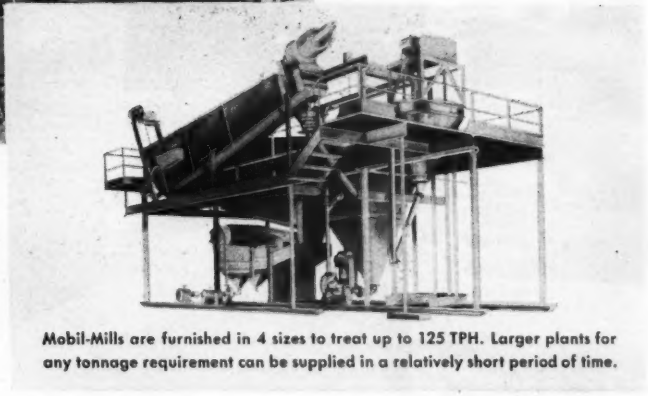

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HEWITT ROBINS

MINE CONVEYORS

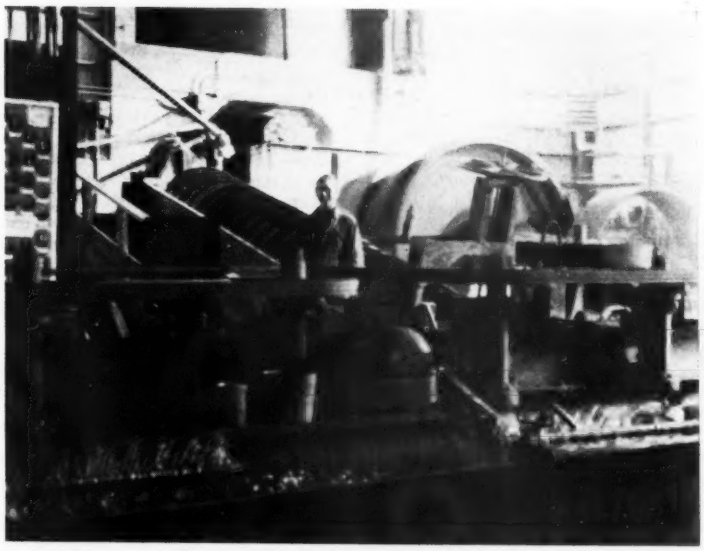
ROBINS CONVEYORS DIVISION **HEWITT-ROBINS INCORPORATED**

Quonset huts serve as change house and shop

By K. K. HOOD
Manager Akron Mine
Callahan Zinc-Lead Co.

Akron Unit Mills Complex Ore

Fluctuating Feed Character Complicates Treatment



Fine grinding-classifier unit of Akron mill

THE AKRON Unit of Callahan Zinc-Lead Co. is located at Whitepine, Gunnison County, Colo. in the Tomichi Mining District at an elevation of about 10,000 ft. Early mining operations date back to the 1870's when Whitepine and the surrounding area boasted a population of 2500 or more. Numerous shallow shafts sunk on the outcrops of the several ore bodies are reported to have produced high-grade ores of lead, silver and zinc, mostly from oxidized ores. No accurate tonnage of ore mined is available but it seems reasonable that up to $1,000,000 of ore, or possibly more, was extracted and shipped to smelters by early operators. Later, when prices of lead and silver declined, mining became unprofitable and the camp was more or less abandoned.

Desultory mining by prospectors, lessors, and others, continued at irregular intervals, but no serious attempt to further explore and develop the district was undertaken until about 1937 when Callahan Zinc-Lead Co. acquired certain interests and began consolidating the various mining claims into a group that is now known as the Akron Mine. The company's first operations were confined chiefly to the mining of small high-grade ore bodies and shipping the ore to custom mill at Leadville. It became apparent early in 1947, however, that in addition to the small high-grade ore bodies there was a larger tonnage of lower grade ore that could be profitably treated in a concentrating mill at the property. Such a mill was completed late in 1947 and has been in continuous operation since that date.

Two mining operations are included in the Akron property—the Akron mine and the Erie mine. The latter, at present, produces a small tonnage of lead-zinc-silver ore from exploration and development work. Sedimentary rocks resting on pre-Cambrian granite underly the Akron mine area. These sedimentary rocks, largely limestone, dolomite, shale and quartzite, have been intruded by quartz monzonite and rhyolite porphyry dikes. The Star fault trends north and south and dips east from 70 to 80 deg and is probably the most important structure in the Akron area from the stand-point of ore occurence, as the so-called "Lost Contact" ore is found along it. This fault is a wide zone of displacement in

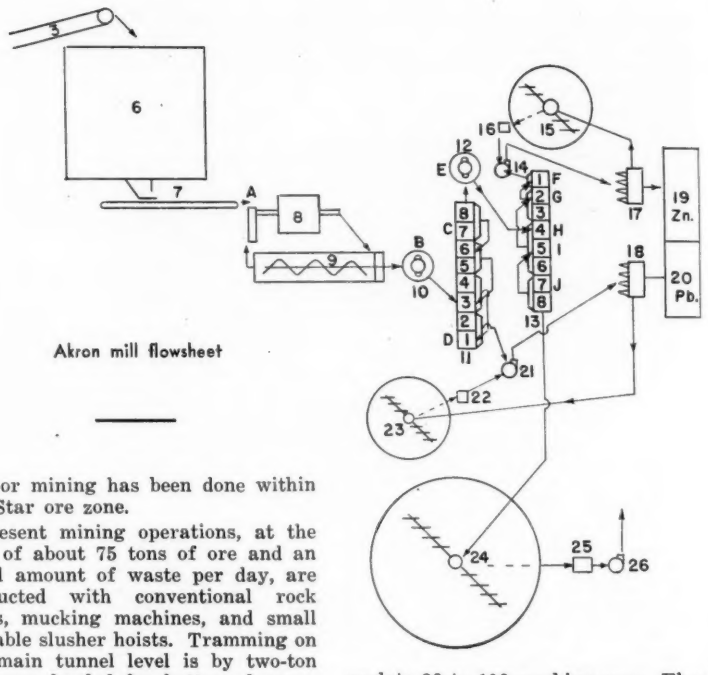
which the rocks have been intensely sheared and shattered and intruded by porphyry dikes of irregular outline. Displacement is large, possibly as much as 2000 ft vertically in reverse direction. The "Lost Contact" ore has been deposited in the intensely sheared limestone west of a large porphyry dike within and adjacent to the confines of the Star fault. Sphalerite, galena and pyrite with some oxidized minerals make up the ore. The average grade of ore mined during the first eight months of 1948 was approximately 5 oz of silver, 12 percent lead and 16 percent zinc. The ore bodies or lenses are not large and vary in width to a maximum of 12 to 14 ft and a length of 200 ft. Due to the intensely shattered ground and the "swelling" qualities of the porphyry, mining costs are abnormally high and mine openings are difficult to hold open. All stopes are heavily timbered and are back-filled with waste rock from hanging wall, stub raises, or development drifts. Approximately 30 bfm of timber are required per ton of ore extracted.

	REAGENTS PER TON										
	A	B	C	D	E	F	G	H	I	J	K	L
Na CN	.2					.05						
Zn SO_4	1.1											
C. A.												
Z 9		.05							.25		.08	
404		.04	.03									
Cu SO_4					1.5							
LIME					1.5							
Fe SO_4					1.0							
METSO							.5					
P. O.								.01				
B 23												
Co POLYSULPH												
MIC. FROTHER		✓		✓								

Reagent table and point of addition

Long Tunnel Taps Ore

A tunnel about 4000 ft long driven in an easterly direction from the portal developed the Star fault area of the Akron mine. It intersects the fault area some 500 ft below the surface ore outcrop. All mining to date has been done above this level. About 2000 ft of drifts, crosscuts, and raises have been driven to explore and develop the "Lost Contact" mineralized zone. Further to the east, another mineralized zone known as the Star ore body occurs in the limestone along the bottom and flanks of a roll or syncline in the steeply dipping limestone. Much of the early mining was done within this zone, where ground conditions were more favorable for mining than in the "heavy" ground along the "Lost Contact" ore. In recent years, however, little exploration or mining has been done within the Star ore zone.



Akron mill flowsheet

Present mining operations, at the rate of about 75 tons of ore and an equal amount of waste per day, are conducted with conventional rock drills, mucking machines, and small portable slusher hoists. Tramming on the main tunnel level is by two-ton ore cars hauled by battery locomotives. At present no pumping is required, although the mine "makes" from a 1000-2000 gpm.

Surface plant and equipment includes about 1500 cfm of air compressor capacity, a well-equipped repair shop housed in a 20 by 60-ft Quonset-type building, a change room housed in a similar building, a sawmill and framing house having a capacity of about 60,000 bfm of timber per month, and a modern camp—including school, store, and boardinghouse—to accommodate 80 to 100 working men. Electric power is purchased from the Public Service Co. of Colorado.

Variable Mill Feed Treated

An all flotation mill treats 75 tons per day of average grade mine ore. A lead concentrate and a zinc concentrate are produced. Ore delivered by the mines to the mill varies in grade and physical qualities over a wide range. It is not uncommon to have mineral content change from 15 percent combined lead and zinc to 40 or

TABLE I

	Lead		Zinc	
	Percent Total	Percent Non-sulphide	Percent Total	Percent Non-sulphide
Dry Grind	27.8	0.10	28.0	0.65
Wet Grind	27.8	2.00	28.0	0.75

TABLE II

	Silver		Lead		Zinc	
	Oz/ton	Recovery Percent	Percent	Recovery Percent	Percent	Recovery Percent
Heads	5.20	100.00	12.55	100.00	16.52	100.00
Lead Concentrate ...	24.07	65.00	63.81	71.26	13.56	11.50
Zinc Concentrate ...	5.75	28.00	8.68	18.23	51.10	78.36
Tails	.60	7.00	2.03	10.51	2.76	10.14

TABLE III

Mesh	Percent Weight Total	Percent Lead Total	Percent Lead Non-sulphide	Percent Zinc Total	Percent Zinc Non-sulphide
Plus 100	6.0	0.6	0.1	2.9	0.4
Plus 150-100 ...	3.5	0.6	0.1	1.7	0.4
Plus 200-150 ...	15.5	0.8	0.5	2.0	0.6
-200 ...	75.0	3.4	2.1	2.8	2.0
	100	2.73	1.66	2.64	1.63

50 percent combined within an hour or two. Physical qualities may change from a relatively hard, dry ore to ore made up largely of clayey material and fault gouge carrying 20 percent water. These conditions cannot readily be controlled in the mine due to the "heavy" character of the ground which at times requires rapid extraction of the ore, and the lack of ample storage facilities both underground and at the mill. The presence of non-sulphide minerals of lead, zinc, and iron, the presence of a relatively large proportion of slime, and copper minerals, often non-sulphide, tend to preactivate the zinc and iron minerals, making the lead-zinc separation difficult.

An unusual condition is the apparent oxidation of lead and zinc minerals during wet grinding operations which is illustrated in Table I.

Metallurgical results for the first eight months of 1948 are shown in Tables II and III.

Mill tailings disposal at Akron is a difficult problem. The mill is located near the bottom of Tomichi Creek canyon, the sides of which are steep,

Akron Unit staff: K. K. Hood, manager; E. B. Lowman, mill superintendent; J. E. Dunn, superintendent; and R. J. Flynn, office manager

cold temperature of mill water, which will average about 36 F, requires close control and supervision of the milling operation. Small quantities of

allowing little room for pond construction. Pollution of Tomichi Creek, an excellent trout fishing stream, is rigidly prohibited. Prior to mill operation a retaining wall or bank was made from mine waste rock along the side of the canyon just above the mill. This provided a settling pond that would retain about 8000 tons of tailings. The bottom of the pond is previous gravel which allows the excess water in the thickened tailings to percolate through about 200 ft of gravel before it reaches Tomichi Creek. A similar pond was then constructed to the south and, as one pond became filled, tailings were diverted to the other. The first pond is then cleaned with a 15-hp, electric, double-drum slusher hoist and 36-in. scraper hoe, piling the tailings around the edges of the pond. The cleaned pond is then ready for use again.

EQUIPMENT

1	100-ton coarse ore bin
2	24-in. belt feed
3	24 by 60-in. shaker screen 1 in.
4	10 by 20-in. jaw crusher
5	18-in. conveyor belt
6	150-ton fine ore bin
7	18-in. V. S. belt feed
8	No. 64 ½ Marcy ball mill
9	36-in. screw classifier
10	3 by 5-ft conditioner
11	8-cell 18S flotation
12	5 by 5-ft conditioner
13	8-cell 18S flotation
14	2-in. sand pump
15	18-ft thickener Zn
16	Diaphram pump
17	4 by 4-ft filter Zn
18	4 by 4-ft filter Pb
19	150-ton concentrate bin
20	125-ton concentrate bin
21	2-in. sand pump
22	Diaphram pump
23	18-ft thickener, Pb
24	30-ft thickener, tails
25	Diaphram pump
26	2-in. sand pump

Economic Mobilization

(*Continued from page* 32)

chaos of the different regionalization plans.

In developing a logical regionalization plan, the following principles should be of assistance:

(1) The states have many historic political, legal, and necessary functions. Accordingly, regional boundaries should not cut across state boundaries, but rather should coincide therewith.

(2) State agencies performing functions directly related to the functions of Federal agencies cannot be ignored or by-passed. The state agencies must be integrated into the total administrative channel.

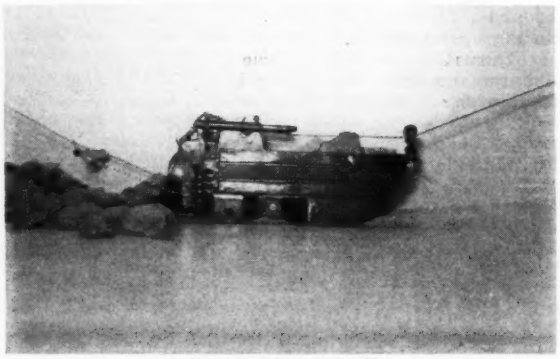
(3) The headquarters of a region should be not more than a day's drive from the regional boundaries. Moreover, it should be possible for an industrialist, a labor representative, a government official, or an officer of the armed forces to get coordinated answers to problems involving plants, labor, rationing, transportation, power, etc., in the same city. Accordingly, each region should have but one headquarters city.

(4) In a future war we cannot afford to neglect Canada, Mexico, and the other nations of the Western Hemisphere. Therefore, regional plans must provide for the conditions and needs of our neighbors, and corresponding government bureaus of the nations of the Western Hemisphere must be properly integrated into the over-all plans for mineral production.

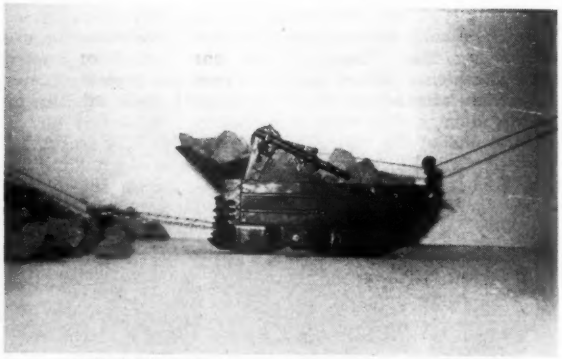
The three great elements that strategy must consider are space, force, and time. The space factor in modern war is global; the atom bomb and other explosives provide almost infinite force; and in an age where the attack can be spearheaded by missiles guided by radio and radar waves that move at the speed of light, and by piloted craft that actually exceed the speed of sound, time is of the utmost importance. The mineral industry provides the materials upon which most of our war potential is based. Consequently, appropriate mobilization planning cannot wait for a future emergency.

To prepare for the unexpected conditions of tomorrow, we must plan today. Of highest priority in current planning should be the establishment of clearly defined areas of responsibility and the chain of command from the highest emergency mobilization agencies in the capital of the nation to the smallest mineral properties in the farthest mountain regions. A uniform regionalization plan for the United States would do much to eliminate confusion and waste.

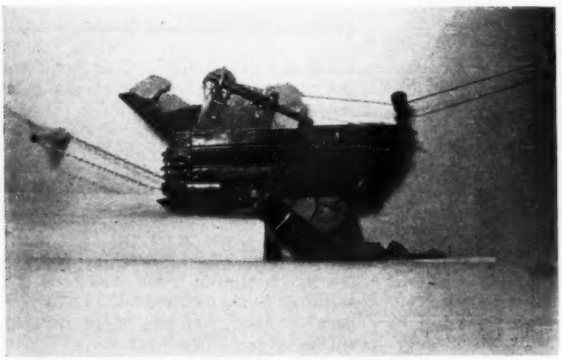
An Unusual Trackless Loader



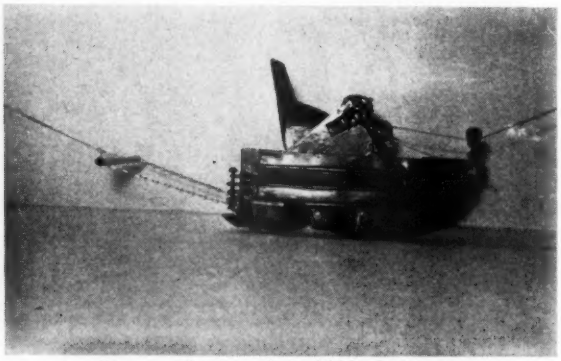
Working model loads itself



Fully loaded, the transport moves to dumping point



Model dumps in a simulated pocket



Dipper and intermediate fold-back retracted

Novel Machine Facilitates Material Movement Underground

By D. I. HAYES
Western Manager
American Zinc, Lead & Smelting Co.

WITH THE idea of providing a high-capacity combination loader and transport of simple mechanical design, a self-loading transport was developed for operation by a single man. The unit is actuated by cables from a slusher type hoist, as in a slusher scraper operation, or by a man riding a tractor equipped with a small winch.

Most loading machines, excepting scrapers, load some type of transport or receptacle, such as a conveyor, mine car, shuttle car, or other vehicle. A scraper of the type used underground or on the surface is, in a sense, a self-loading transport, in that it loads a small parcel and transports it a limited distance but it is not an efficient loader or transport. In underground work scrapers have a sharply declining capacity beyond 50 ft of transport distance and under many conditions are unsatisfactory and ineffective beyond 100 ft.

Inasmuch as the self-loading transport is a novel device patent application has been on file for a considerable time. The self-loading transport is mechanically simple and of a shape design that does not limit adequate sturdiness with a wide margin of safety for varying conditions. It has six steel wheels, 12 in. in diameter, with 6 in. wide tires for a five-ton machine, supplemented by pick-up skids and wheel housings that prevent obstruction or blocking of the wheels. The wheels may have antifriction bearings. Otherwise, there are only three moving parts with maximum movement of about 60 deg. No precision machining of any kind, except wheel bearings and pulley blocks are required. One dozen grease-gun fittings, filled once a week, would insure sufficient lubrication. Except for one heavy hinge bolt, there is no need for bolts or nuts. Operating adjustments to suit variable conditions can be made quickly, without tools, by the operator. By removing one nut and pulling two hinge pins the machine is completely dismantled into its four parts. Construction of the main parts, namely the shovel or dipper, intermediate fold-back, dump door, and body is of structural steel, mainly plate, with a small amount of tubing and structural shapes, and no bolts or rivets. The entire unit is welded construction and with no machining of any kind required, other than drilling of a few holes.

No Track Needed

A trackless machine, the self-loading transport clears and grades its own roadway. It cleans and sweeps up a muck pile in the same manner

as a hand shoveler. It will load and grade when the muck is scattered and it does not matter whether the muck pile is inches or feet in thickness. There is no limit to the distance the transport can be crowded to fill the dipper shovel.

In operation the self-loading transport is pulled forward by the slusher rope cable or pushed by a tractor from the dumping point to the material to be loaded, with the dipper down, if grading is necessary. This direction of motion is maintained until the dipper is full. Then the dipper is elevated by applying the slusher pull back drum or tractor winch. This movement folds and crowds the dipper load into the transport compartment. In the dipper elevating movement, the dipper finally reaches a stop and the entire machine moves backward under control, usually about ten feet, where pulling is stopped and the dipper automatically folds down by gravity into the shoveling position, where it is pulled or pushed forward again for another dipper full, which is elevated and folded back into the compartment as before. These motions are continued three or four times, occupying 40 to 60 seconds, and a full capacity load is now on wheels, amounting to one ton, two tons, five tons or a much larger parcel, depending on the size of the machine. The final dipper full blocks itself and the operator just keeps pulling on the machine and it takes off as a transport and it is pulled to the dumping point, where the dump door in the rear of the machine automatically drops down, permitting automatic elevation of the bottom of the compartment inclined backward to a stop at any pre-determined position, so that the machine discharges its entire load backward on an incline chute. Through all these motions the body, with its wheels, does not change its position with reference to the roadway.

Material may be transported over any distance, so long as the operator, in a general way, can see what he is doing, either from his station at the slusher hoist, or his seat on the tractor. The machine loads easily from the most formidable rough muck pile as it works on the toe. A two-ton machine will load boulders far in excess of the size that can be handled through any ordinary chute door opening or crusher. A two-ton machine will load a boulder weighing one ton.

Design permits construction of the unit in almost any size. A machine 24 in. wide has a carrying capacity of about one ton; a 36-in. machine about two tons, a 48 in. wide machine about five tons. It can be designed so that one trip will hold one mine car load. Little head room is required. As an example: a five-ton machine has a maximum folded height of about six feet. The center of gravity of the loaded machine would be about 18 in. off the ground. A one-ton capacity machine has a maximum folded height of about four feet. It is not known what the limit of the transport distance would be for economical operation, but it could be a considerable distance, in view of the fact that a substantial load is on wheels and can be transported over rough terrain, without tracks or roadways, other than that which the machine makes for itself. The machine will discharge its load through a floor opening, such as the top of a chute raise, or a hole in a car loading ramp. The patents provide for a level end dump, which is facilitated by the addition of a third folding compartment.

Capacity considerations involve the transport distance factor. A two-ton machine, with one operator, at 100 ft transport distance, will load, transport, and dump into a chute raise at the rate of about 60 tons per hour, including the time used in breaking or moving out of the way, with the machine, large boulders that cannot be handled through the mine chute gates and crusher. Under this condition, the machine has an hourly capacity of six to ten times the capacity of the maximum size scraper that the same power slusher hoist would handle.

Low Power Requirements

A 15-hp slusher will operate a one-ton machine, a 25-hp slusher hoist will operate a two-ton machine, and a 50-hp slusher hoist will operate a five-ton machine; rope speeds range from 200 to 250 fpm. Most of the cycle time and a small proportion of the total power available is used in transport of the machine, empty or loaded, to and from its mucking position. Maximum power is needed for crowding the shovel lip into the muck pile. It appears that a crowding pressure of 2400 lb at 200 fpm for a one-ton machine with a 36 in. wide dipper is sufficient, 4000 lb for a two-ton machine with a 48 in. wide dipper, and 8000 lb for a five-ton machine with a 66 in. wide dipper. Much lower rope speed could be used to an advantage in the crowding operation, which would cut down power requirements greatly. A three-drum slusher-hoist will give much greater capacity than a two-drum hoist.

This device, it is believed, is the only self-loading transport for rough material in existence. It is the only vehicle that loads and moves itself with a substantial quantity of material exceeding one dipper or bucket load. The self-loading transport will load and transport upgrade, on the level, or downgrade or on a combination of grades. Skids or runners may be used instead of wheels, or a combination of skids at one end and wheels at the other end may be employed. In mines and on the surface, in quarries or at stockpiles, this device operated by one man will accomplish what usually requires several pieces of heavy and expensive equipment operated by several men. The photographs are taken of a replica model illustrating cable-type operation. Application of this self-loading transport may be expected to effect comparative economies in equipment cost, operating power, repairs, and labor.

Tractors and Trailers For Supply House

(*Continued from page* 30)

A check of work done over 14 shifts showed an average of 3000 lb hauled 1500 ft per shift with only a 40 percent drop in the rated capacity of the battery. An average of 6.3 trips were made per shift, with close to 500 lb pay load per trip. With the new trailers now being manufactured for this purpose, pay loads of 1000 lb per trip look entirely reasonable, under normal conditions, without dangerously discharging the battery.

Possibilities for Tractor-Trailer

The success of these operations, transporting from supply yard to face without rehandling, gives rise to the thought that this method need not be confined necessarily to the single sets of entries on contour operation. With proper conditions of height, top, bottom and grades, any new mine, not tracked to the working face, might well be laid out to provide a supply road parallel to the haulway with tractor-trailer supply delivery in mind, regardless of whether main line haulage is all belt, all rail, or a combination of both. Belt lines could be crossed by a ramp and removable bridge, or by underpass, whichever is easier. Tracks could be crossed by grade crossings. This is now being done at our Glover Splint and Van Lear mines.

Trailers can be designed to fit mine conditions and supplies to be handled. In addition to the conventional supply trailer, special purpose trailers are now available—the man-trip trailer, powder trailer, greasing trailer, trailer-mounted fire-fighting equipment, water boxes for bailing or dust-allaying—in fact, everything that previously ran on rails.

WHEELS OF GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

THE MEMBERS of the House have returned fresh from their ten-day Easter vacation and "grass roots" contacts to do battle with the labor bills and later the Wage-Hour bills. The Senate had no vacation, remaining in session on the appropriations measures and the housing bill after clearing the $5,580,000,000 ECA bill which has since been signed by the President. Opinions differ as to the probable date of adjournment, but there is a general belief that there will be a special session in the Fall.

Trade Agreements

The recent drop in metal prices has still further stimulated interest in the bill extending the authority of the President to negotiate foreign trade agreements until June 12, 1951. With the Senate pressing to clear its calendar, the bill is subject to floor action in the near future and the possibility of acceptance of the "Bailey amendment," which would exclude strategic and critical materials from further duty cuts by the trade treaties, is being closely watched.

Meanwhile, the bill by Representative Mills of Arkansas which would continue the suspension of the duty on lead to June 30, 1950, remains subject to the action of the House Committee on Ways and Means. The Committee has received reports from the interested Departments and agencies on the measure, although no action has been scheduled at the present time.

Social Security

Scheduled to close at an early date, the House Ways and Means Committee hearings have continued since March 23 on the Administration's Social Security bill to extend and liberalize old age and survivors' insurance benefits and broaden the coverage of the present law.

Coal industry witnesses have urged discontinuance of the employer portion of the payroll tax, in order that coal mines and other industries with high labor costs may be placed on a more equal basis. They vigorously maintain that the employer tax discriminates against the coal industry. It was suggested that one-half the cost be borne by the beneficiaries and one-half by a national sales tax or from general revenue. Testimony was presented that the coal industry pays more than 5 percent of total social security taxes although the value of its gross national products is only 1 per cent of the national total.

Section 409 of the bill under consideration, H. R. 2893, would repeal the Gearhart bill of the 80th Congress and bring independent contractors, block-leasers, split-check leasers, etc. under the Act as employes. Many of those interested in the status of independent contractors are asking the Committee to strike Section 409 from the bill, while others are recommending that the present common-law rule remain the dividing line between employes and the self-employed, and that coverage be extended to the self-employed as such under the income tax approach which has been suggested by the Treasury and the Social Security agency.

Labor Bill

On April 11 the House Rules Committee sent the Administration's labor bill to the floor with an open rule, and the measure is now under debate and subject to amendment. Representative Wood of Georgia has introduced a revised version of his bill discussed in the April JOURNAL which, while retaining the major features of the Taft-Hartley Act, is somewhat more moderate in nature. This is now the bill which the coalition of Republicans and Southern Democrats are endeavoring to substitute for the Administration measure.

The new Wood bill still carries the provisions of the Taft-Hartley Act relating to supervisory employes, under which an employer is not required to recognize any organization of supervisors for collective bargaining purposes, and no change is made in the T-H provisions as to welfare funds. Also continued is the independent status of the Federal Mediation and Conciliation Service and of the NLRB General Counsel. The employer's free speech provision is retained as well as that making unions responsible under their contracts.

Major points of interest to mining on which the Wood bill departs from the T-H Act provisions permit unions operating under union shop agreements to expel members, and employers to discharge them, because of participation in strikes or concerted activities in violation of contracts, or because of Communistic activities. Strikers would be made eligible to vote in NLRBoard elections, if they are entitled to reinstatement or their places have not been filled by permanent replacements for six months or more preceding the date of the election. The provision requiring the Conciliation and Mediation Service to take a vote among employes on an employer's last offer of settlement is eliminated. The authorization for a

★ ★ ★ ★ ★ ★ ★

Washington Highlights

CONGRESS: Fall Session rumored.

TRADE AGREEMENTS: Senate to consider bill.

SOCIAL SECURITY: Independent contractor status threatened.

LABOR BILL: Under debate in House.

WAGE-HOUR: Early House consideration.

INCENTIVE PAYMENTS: Engle subcommittee approves bill.

ASSESSMENT WORK: 1949 time extended through Sept. 30.

COAL CONTRACT: UMWA studies demands.

★ ★ ★ ★ ★ ★ ★

check-off is limited to one year, or to the termination date of the contract. The President is given power to use injunctions in national emergency strikes before appointment of a Board of Inquiry.

In his new version Rep. Wood drops from his original bill the provision declaring it an unfair labor practice for a union to seek to compel an employer to violate any U. S. law. Also dropped is the provision authorizing the NLRBoard, in remedying unfair labor practices committed by unions, to direct payment to employes of wages lost because of unfair labor practices; the provision prohibiting the check-off of initiation fees and special assessments; and the provision making the requirements pertaining to welfare plans equally applicable to any trustee or trust fund set up to receive payments from employers.

Senate floor consideration of the Administration labor bill is not expected until after the House passes a labor measure in some form. There are, however, reports of compromises in the Senate on the provisions of the proposed Taft-Hartley Act amendments to the Administration bill.

Wage-Hour

The Senate Committee on Labor and Public Welfare now has the Administration bill amending the Wage-Hour Act under consideration following the conclusion of hearings April 22. As in the case of the Labor bill the House is expected to act first on the Wage-Hour amendments. The House Committee on Rules is expected to grant an open rule on the bill as reported March 17 and discussed in the April JOURNAL. Again a coalition of Republicans and Southern Democrats will drive for a substitute measure to replace the Administration bill.

This substitute, by Representative Lucas of Texas, would require payment of a minimum wage of 65¢ an hour from 60 days after enactment up to December 31, 1949; thereafter the minimum wage for each calendar year would be established by administrative wage orders to be issued on or before December 10 of each year. The Administrator would determine a wage by formula but could not prescribe a rate of less than 50¢ an hour.

Among other changes which the Lucas bill would make in the current Wage-Hour law are: (1) redefines "commerce" to bring importers of goods from foreign nations under the Act; (2) redefines production of goods for commerce to exclude activities necessary to production (now under the Act) and to include in lieu of this coverage basis, employes engaged "in any closely related process or occupation indispensable to the production" of goods for commerce; (3) exempts from wage and hour provisions of Act "any employes employed by any retail or service establishment, more than 50 percentum of which establishment's annual dollar volume of sales or of goods or services is made within the State in which the establishment is located;" (4) defines "regular rate" to exclude gifts and payments in the nature of gifts; payments made for occasional absences due to vacations, holidays, illnesses, etc.; travel expenses; profit-sharing bonuses under a bonafide profit-sharing plan or trust to the extent payments to the employe "are determined without regard to hours of work, production or efficiency"; talent fees; contributions irrevocably made to trust funds for employe benefits; premiums paid for work in excess of 8 hours daily, 40 hours weekly or for work in excess of "the employe's normal working hours or regular working hours," premiums paid at time and one-half for work on Saturdays, Sundays, holidays, or regular days of rest, or on the sixth or seventh day of the workweek, and premiums paid at time and one-half or better for work outside "the basic, normal or regular work day (not exceeding 8 hours) or workweek, not exceeding 40 hours." It is specified that these last three types of premiums "shall be creditable toward overtime compensation payable" under Section 7 of the Act.

The Lucas bill would give the Administrator the kind of rule-making authority vested in the Administrator by the Portal-to-Portal Act by providing "that no liability, disability or punishment shall apply to any act done or omitted in good faith in conformity with any written regulation, order, or interpretation of the Administrator . . . ". The Administrator would be authorized to "supervise" payment of unpaid minimum wages or unpaid overtime. Provision is made that upon full "supervised" payment and "agreement of any employe to accept such payment" the employe waives his rights to sue for double damages.

Incentive Payments

The House Public Lands Mines and Mining subcommittee under Chairman Clair Engle of California has approved an incentive payments bill under which a division in the Department of Interior would make written contracts with producers of ores, metals and minerals determined to be strategic or critical, for production payments as prescribed by the division's director. These payments would be an amount per unit in excess of market price, limited so that the total received by the producer would not exceed the highest wartime price, including premiums, adjusted for increases or decreases in the BLS index of wholesale commodity prices. Production payments could be withheld in the event the producer utilizes his labor force to mine lower grade ore than his average in the mine, or if he pirates labor from other mines, or if the payments do not result in increased output in the local district.

Exploration contracts are also authorized in which Government contributions would not exceed the following portion of the cost on an annual basis; 90 percent of the first $10,000; 80 percent of the next $10,000; 70 percent of the next $30,000; 60 percent of the next $50,000; 50 percent of the next $50,000; 40 percent of the next $100,000; and 10 percent of any amount in excess of $250,000. "Costs of exploration" would include direct labor and supervision, materials and supplies, and overhead.

RFC would purchase all production and transfer it to the national security stockpile. The RFC would make all disbursements for exploration and production payments, not to exceed $100,000,000 in any one year.

Assessment Work

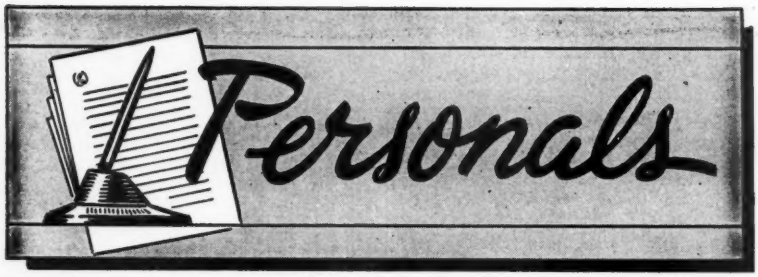
Now on the House calendar is a bill by Representative Granger of Utah extending the time within which this year's assessment work may be performed from July 1 to October 1, 1949. This does not apply to Alaska, and its approval by the House Committee on Public Lands indicates that there will be no more moratoria on assessment work.

The Bureau of Land Management recently proposed a change in the mining law to require $300 of annual assessment work on claims, increasing to $600 if the claim holder failed to file application for patent within five years after location. This proposal met the pointed disapproval of the Department of the Interior's National Minerals Advisory Council, during the Council meeting on April 28. The Council expressed its belief that administration of the mining law should be speeded up and liberalized and that proper protection should be given to prospectors employing geological and geophysical means in their efforts to locate additional ore deposits.

Coal Contract

Meeting here in late April, the UMWA policy committee concluded its sessions without announcement of wage and working condition demands, which will later develop in the mine workers' negotiations with the operators for a new contract to replace the present agreement expiring June 30. At a press conference John L. Lewis merely called for peaceful settlement of the forthcoming negotiations, and there is conjecture that he may have been influenced in his pronouncement by the current Congressional situation on the Administration's labor bill.

(*Continued on page* 58)



Erle V. Daveler, vice-president and director, American Zinc, Lead and Smelting Co., has been elected a director of the Warren Pipe & Foundry Corp. in place of **Leonard Peckitt,** retired.

Kenneth Hughes, Consolidation Coal Co. (Ky.) has been transferred from his position as superintendent of the Winters Mine at Farraday, Ky., to superintendent of the new Hendrix mine at Deane, Ky., which will soon start development. **R. J. Collins,** mine foreman at Winters mine, has been promoted to superintendent there.

R. B. Shelledy was recently chosen to serve as president of the Mining Association of Montana. He succeeds **Gailen T. Vandel,** formerly vice-president and general manager, Jardine Mining Co., who has accepted a position with the Cerro de Pasco Copper Co. in Peru.

Curtis E. Hutson, formerly an employe of the Valier Coal Co., has been appointed state mine examiner for District 19 of Illinois. This district includes 17 mines in Williamson County, Ill.

James S. Steele has been appointed field supervisor of explorations in the mining engineering department of the Oliver Iron Mining Co.

Dr. **Milton H. Fies,** manager of coal operations for the Alabama Power Co., has been appointed consulting engineer to the Office of Synthetic Liquid Fuels of the U. S. Bureau of Mines. He will continue in his present position as part time manager for the Alabama Power Co. while doing consultant work for the Bureau.

Archie A. Nelson, formerly research engineer at the Midvale plant of U. S. Smelting Refining and Mining Co., has been appointed assistant smelter superintendent. He succeeds **W. M. Whitecotton** who has asked to be relieved because of his health. Mr. Whitecotton will remain in the Midvale plant as research engineer. **F. J. Marshall** has been advanced to general blast furnace foreman at Midvale. **Melvin J. Belich** succeeds Mr. Marshall as general roaster foreman. **Edgar C. Norman** has been advanced from general unloading foreman to research engineer. He is succeeded by **Walter C. Anderson. Hughes B. Hanchett** and **Kenneth E. Tame,** will alternate as night foremen replacing Mr. Anderson and Mr. Belich.

Earl M. Maurer is now president and general manager of the Rail & River Coal Co., Bellaire, Ohio.

Merrill E. Shoup, president, Golden Cycle Corp., and executive vice-president and director of the Holly Sugar Corp., was recently elected president of the Holly Corp. to succeed **Wiley Blair, Jr.**

W. D. Hughes, former manager of the Pennsylvania and Maryland operations of the Johnstown Coal and Coke Co., was recently made general manager in charge of all operations. **J. N. Crichton,** former superintendent of the company's Beaverdale, Pa., operations, was made general superintendent of all Pennsylvania operations. **Roy Joseph,** formerly with the Pennsylvania Department of Mines, was made general superintendent of the company's Maryland and West Virginia operations.

E. T. Stannard, president of Kennecott Copper Corp. since 1933, will retire this year. He may be succeeded by **Arthur D. Storke,** president and a director of Climax Molybdenum Co.

H. E. Leilich, formerly mechanical engineer and power plant project manager for the Rust Engineering Co., has joined the staff of the Peter F. Loftus Corp., engineering consultants, of Pittsburgh, Pa.

Ora H. Rostad, formerly with the Jardine Mining Co., Jardine, Mont., has joined the Metaline Mining Co., Metaline, Wash.

Dr. **Morris M. Leighton,** chief of the Illinois geological survey for the last 26 years, and a former president of the Illinois Mining Institute, has been designated president-elect of the Society of Economic Geologists for the annual term, 1950-51.

Charles H. Behre, Jr., vice-president, Behre, Dolbear and Co., New York City, left recently for Burma where he will make headquarters at Rangoon in preparing recommendations for the industrial and mining rehabilitation of Burma. **Arthur S. Hecht,** consulting engineer, San Francisco, is now an associate of Behre, Dolbear and Co.

L. Russell Kelce, formerly executive vice-president, has been elected president of the Sinclair Coal Co. to succeed the late Grant Stauffer. Mr. Kelce is active in the affairs of the American Mining Congress and the National Coal Association.

Merl C. Kelce, formerly vice-president in charge of operations and head of the St. Louis office, was named executive vice-president of the company. **T. L. Kelce,** former general superintendent of Sinclair's western division, was elected a vice-president.

Earl A. Riley and **Thomas C. Cheasley** were elected assistants to the president.

Earl S. Mollard and **C. E. McManus,** Hibbing, Minn., have been appointed assistants to the general manager of The M. A. Hanna Co. **Gust Weggum** has been made mechanical consultant and his duties as master mechanic for Butler Bros. properties have been taken over by **O. J. Anderson. Harry A. Larson** has been appointed assistant chief engineer at Cooley, Minn., for the company.

E. D. Conaway, Jr., has been promoted to assistant mining engineer in the Pittsburg engineering department, coal division, Eastern Gas & Fuel Associates. **William Laird,** formerly resident engineer at Sonman, succeeds Mr. Conaway as resident engineer at Kopperston.

A. L. Hayes, formerly superintendent of the Empire Zinc Co., Hanover, N. M., is now in the New York office of the New Jersey Zinc Co. as assistant to the general manager of mines. **S. S. Huett** succeeds him at Hanover.

Homer Morris, formerly production foreman, has been named superintendent of the Wolf Run mine, Warner Colleries Co., Wolf Run, Ohio. He succeeds **Tom Patterson** who has resigned.

Donald M. McLaughlin has been elected to the board of the Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho. He replaces **P. R. Bradley,** deceased.

Harry J. Evans and **Richard A. Suppes,** mining engineers for Pierce Management, Scranton, Pa., are in Korea studying the economic potentialities of four coal fields in southern Korea.

Walter Eadie, mine manager of Orient mine No. 2 of the Chicago, Wilmington & Franklin Coal Co. since 1939, has been appointed director of the Illinois State Department of Mines and Minerals by Governor Adlai Stevenson. Mr. Eadie is a veteran of 43 years of active service in the Illinois coal mining industry. He succeeds the late **William J. Starks** who died suddenly shortly after his appointment. Professor **Harold L. Walker** of the University of Illinois has been serving as acting director since Mr. Starks' death.

Robert Wallace, manager of the Midvale plant of U. S. Smelting Refining and Mining Co., retired April 1 after 33 years of continuous service.

Mr. Wallace's well deserved retirement comes after 44 years of interesting work and achievements in the mining and smelting industry. After varied experience in Michigan, Mexico, Arizona, Tennessee, and Montana, he came to Utah in 1914 where he was employed for the balance of his long and successful career.

Hugo L. Johnson, who has been with the company for 33 years, is appointed general superintendent of the Midvale plant, effective April 1, 1949. In this capacity he will have direct charge of all operations and in the ore purchasing department formerly handled by Mr. Wallace.

— *Obituaries* —

Sydney H. Ball, 71, prominent mining geologist and an authority on precious stones, died on April 8 in New York City. After graduation from the University of Wisconsin, Mr. Ball spent four years with the U. S. Geological Survey. In 1907 he headed an expedition to survey the Forminiere mineral concessions in the Belgian Congo. His services in opening up the minerals resources of the Belgian Congo were officially recognized by King Albert, who named him a Chevalier of the Royal Order of the Lion.

Since 1917, Mr. Ball has been a member of the firm Rogers, Mayer & Ball, consulting engineers in New York. During this time he contributed to the Minerals Yearbook as author of the yearly review on gem stones.

Mr. Ball was a former president of the Society of Economic Geologists and the Mining and Metallurgical Society of America. He was a consulting mineralogist for the U. S. Bureau of Mines, a governor of the Explorers Club, and a former governor of the Mining Club.

Alexander Grant McGregor, 69, the mechanical engineer who designed and supervised the construction of many of Arizona's important mining, metallurgical, and smelting plants, died in London, England, March 4. McGregor, a graduate of the University of Montana, entered the private consulting field early in his professional career and achieved world recognition for the design and construction of mining and metallurgical plants. Among them were: International Smelting Co. at Miami, Ariz.; New Cornelia Copper Co.'s leaching plant at Ajo, Ariz.; United Verde Extension at Jerome, Ariz.; Inspiration Consolidated Copper Co.'s leaching plant at Inspiration, Ariz.; Phelps Dodge Corp.'s new smelting units at Douglas, Ariz.; and Cerro de Pasco Copper Corp.'s new smelting works in Peru. He served as consulting engineer to a number of African copper companies, including Roan Antelope, Mufulira Copper, and African Selection Trust. During World War II McGregor was consulting engineer to the British Ministry of Aircraft Production and to Nonferrous Mineral Development Control. He was the author of a number of articles and books, principally on economic subjects.

Arthur J. Chouinard, general manager of domestic sales for Island Creek Coal Sales Co., died of a heart attack on March 24 while en route from Chicago to Huntington, W. Va. Mr. Chouinard was 53 and had shown no previous signs of illness. He had been in the coal industry since 1920 and since 1939 was associated with the Island Creek Coal Co.

Frederick W. Snow, 65, of Manti, Utah, died on March 8 at Hanover, N. H., following a short illness. Snow retired in 1928 as superintendent of Magma Copper Co. at Superior, Ariz. Since 1943 he has served as president and general manager of the Vermont Copper Co.

Frank E. Vigor, 62, vice-president in charge of operations, Armco Steel Corp., died April 12, at Cleveland, Ohio. Mr. Vigor joined Armco in 1910 and advanced rapidly to the post of assistant traffic manager, assistant manager, and then manager of the company's Ashland, Ky., division. He became general traffic manager for the company in 1939. In 1943 he was elected vice-president in charge of manufacturing and mining operations.

He performed valuable services during World War II as a member of the Iron and Steel Section of the OPA. Later he was assistant director of the Steel Division of WPB.

He was active in civic affairs in the communities in which he lived and had many important industrial responsibilities. He was a member of the board of directors of: Columbia Transportation Co., St. James Mining Co., Castile Mining Co., Reserve Mining Co., Lake Superior Land Co., Northern Land Co., Butler Brothers, Consumers Ore Co., and Hanna Ore Mining Co.

Willard H. Dow, 52, chairman of the board and president of the Dow Chemical Co., and an important figure in the development of the magnesium industry, died on March 31 in an airplane crash near London, Ontario, Canada.

John N. Becker, 70, who has been closely associated with the Newmont Mining Corp. in foreign and domestic operations, died recently at his home near Nevada City, Calif.

Jan Van Houten, 81, president of the St. Louis, Rocky Mountain & Pacific Coal Co., Raton, N. M., died March 8 at his home in Denver, Colo. Mr. Van Houten who was widely known as a coal mine operator had directed the activities of his company since 1912.

Alvin Luck, 68, head of the Luck Mining and Construction Co., Silver City, N. M., died on March 18. Mr. Luck had long been active in metal mining in the state of New Mexico and once operated the Boston Hill manganese mine at Silver City.

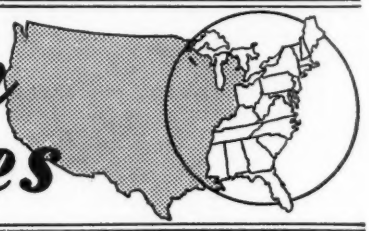
Joseph Yob, co-owner, with his wife, of the Philipsburg Mining Co., died in February in Santa Monica, Calif. He was a widely known Montana mining engineer and considered an expert in reclaiming abandoned nonferous mines for return to production.

Samuel H. Linn, 75, died in Wallace, Idaho, February 21. He had been associated with W. L. Zeigler in the production of the first commercial zinc concentrates shipped from the Coeur d'Alene district. He was at one time general mine manager at the Hypotheek.

Robert S. Mayer, 53, mechanical superintendent of Tooele Smelter, International Smelting & Refining Co., died at Tooele, Utah, on March 3.

NEWS and VIEWS

Eastern States



New Coal Operation

Eastern Gas & Fuel Associates are extending their operations near Kopperston and Wharton, W. Va., with the opening of a mine at Clinton, about 16 miles from the model mining community of Kopperston. Reports indicate that both the Hernshaw and Winifrede seams will be mined. At present the coal is being dumped over a makeshift tipple at the rate of 750 tons daily, but by late summer the cleaning plant will be operating and handling 2000 tons of coal daily.

Cobalt Plant to Move

The New Cross Chemical Co., of Croydon, England, plans construction of a plant at Cobalt, Ontario, adjacent to the mines and smelter of Silanco Mining & Refining Co., for producing salts, oxides, powders, chemical solutions and other cobalt derivatives. The already short supply of cobalt in England is expected to be aggravated as the rearmament program of the Atlantic Pact is effected. Cobalt's high heat-resisting qualities are required in the construction of jet air craft, turbines, rockets, controlled missiles, tool steel, and gun linings. With the channeling of more metallic cobalt for rearmament purposes into this type of production a shortage of cobalt in unrefined form, as used by the chemical industry, may be created.

The new plant will be located near the Silanco smelter, which is now nearing completion. This smelter, the largest of its kind in the Western Hemisphere, will have a capacity for treating ten tons of concentrates daily.

Strip Mine Reclamation

Work has begun in four counties of western Kentucky to improve the looks of strip mine and other spoil banks. The Kentucky Reclamation Association will plant areas in Hopkins, Webster, Muhlenberg, and Ohio Counties, totaling more than 500 acres. Seeds will be sown from a helicopter. Seeding trees will be planted on another 500 acres.

Market Closes Mine

The Hocking Valley Coal Co. mine No. 1, at The Plains, Ohio, has suspended operations. E. A. Cottingham, superintendent, blames "market conditions." The mine, largest in the Hocking Valley, produced 900 tons per day.

AS&R Marks 50 Years

On April 4, 1949, The American Smelting & Refining Co. celebrated its 50th anniversary. Open houses or some similar entertainment were held at the plants, and tours of the plants for employe's families were the order of the day.

The mining and smelting activities of the company are widespread. Mines are located in Newfoundland, Canada, United States, Mexico, Nicaragua, Peru, Bolivia, Australia, Saudi Arabia, and the Gold Coast Colony in Africa.

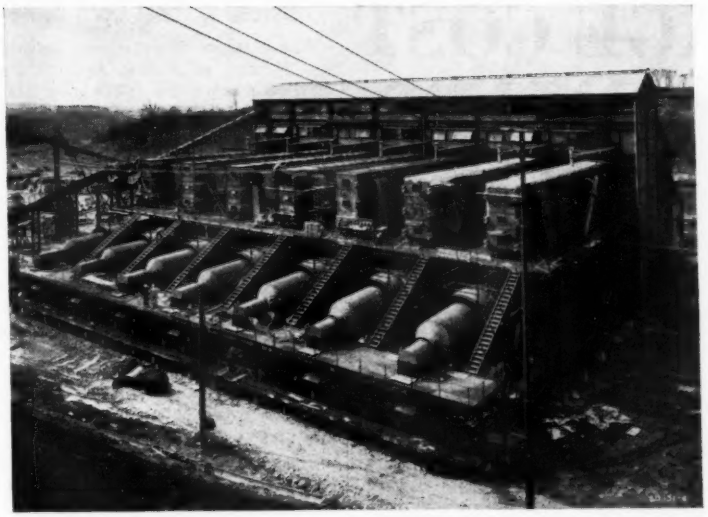
ASARCO exemplifies public ownership of a large organization. As of December 31, 1948, there were 30,318 stockholders, with no one person or group owning as much as three percent of the outstanding stock.

Mining Extension Courses

With the object of providing more properly-trained personnel for the mining industry, some 20 Kentucky coal operators, association secretaries, and professors recently met at the University of Kentucky for the purpose of extending the work of the department of mining engineering. Two committees were authorized, one to prepare a plan for the development of extension courses in mining in the mining areas of Kentucky, and the other to cooperate with the department of mining engineering in revising the course when needed in order to make it a maximum value to the state.

Excess Baggage

—Huntington Advertiser



New Disco Plant Open

On April 10, near Pittsburgh, Pa., the world's largest plant for producing smokeless solid fuel from bituminous coal by the low temperature carbonization process was formally opened. The dedication of the new plant of the Disco Co., a subsidiary of Pittsburgh Consolidation Coal Co., was attended by more than 100 guests who saw high volatile western Pennsylvania coal processed into Disco smokeless solid fuel.

George H. Love, president, Pittsburgh Consolidation Coal Co., in a welcoming address, explained that the plant will be at capacity production in time to meet the needs of the next heating season. He stated that the new plant will give the area an annual production of 250,000 to 300,000 tons of Disco fuel.

The Disco process produces homogeneous briquette-like balls by a two-step process of completely continuous low temperature carbonization. The raw material for the process is cleaned and specially prepared high volatile bituminous coal. Gas and a low temperature tar of rich quality are by-products of the operation.

The new plant, which will consume about 400,000 tons of coal annually, incorporates modern equipment and controls which enable production of Disco fuel at a cost of $2 under that of the product of the old experimental plant.

Lead Industries Meeting

In addition to the regular business session, a program of speeches was included in the annual meeting of the Lead Industries Association, held in Chicago, April 8 and 9. More than 100 attended this 21st annual meeting when prominent members of the industry discussed vital topics of interest. The morning session of the first day was devoted to a panel discussion of the lead production outlook. F. S. Mulock, vice-president, United States Smelting Refining & Mining Co., presided at this session. J. B. Haffner, general manager, Bunker Hill and Sullivan Mining and Concentrating Co.; F. A. Wardlaw, Jr., general manager, International Smelting & Refining Co.; Francis Cameron, vice-president, St. Joseph Lead Co.; R. F. Goodwin, vice-president, American Smelting & Refining Co.; Marc S. Goldsmith, president, Goldsmith Bros. Smelting and Refining Co.; and Dr. R. B. McCormick, chief, Nonferrous Metals Division, Munitions Board, all contributed to the session covering the domestic and foreign supply position of lead.

The afternoon session, covering the outlook for some important lead products, was presided over by D. A. Merson, vice-president, National Lead Co. The following men, specialists in their respective fields, presented their thoughts on the outlook for special products: R. K. Spofford, purchasing agent, The Okonite Co.; J. H. Schaefer, vice-president, Ethyl Corp.; W. P. Carroll, manager, Metal Department, National Lead Co.; M. M. Zoller, vice-president, The Eagle-Picher Sales Co.; A. R. Knight, manager, Euston Lead Co.; A. M. Callis, general sales manager, Federated Metals Division, American Smelting and Refining Co.; and H. A. Harvey, vice-president, Auto-Lite Battery Corp.

At the regular business session of the annual meeting, Felix E. Wormser, president; K. C. Brownell, vice-president, and J. A. Martino, vice-president, were reelected. The existing board of directors were unanimously re-elected. The executive committee, appointed by the board of directors, includes the officers, as well as L. E. Hanley, president, Hecla Mining Co., and George Mixter, vice-president.

Coal Geology Laboratory

In a joint announcement, Dr. W. E. Wrather, director, U. S. Geological Survey; Dr. Edmund M. Spieker, head, Department of Geology, Ohio State University; and Dr. John H. Melvin, state geologist of Ohio, stated that a new coal geology laboratory intended to facilitate geologic studies of the nation's coal resources will soon be established by the U. S. G. S. and Ohio State University.

The main objective of the new laboratory will be to conduct research on the fundamental nature of the fossil plants that compose coal. In combination with the field investigations, laboratory studies should aid in the delineation of coal deposits that are suited for special purposes, such as conversion to synthetic liquid fuels, or the manufacture of coke. Research should also aid correlation of coal beds in different areas and provide important information in calculating coal reserves.

Bureau of Mines Open House

The Eastern Experiment Station of the Bureau of Mines, College Park, Md., celebrated the 100th anniversary of the establishment of the U. S. Department of the Interior by holding open house on Thursday, April 21. Visitors had a splendid opportunity to see the Bureau's scientists and technologists at work in the search for new and better materials and of ways of utilizing lean and complex ores.

A visit to one laboratory gave insight into the problems involved in production of titanium. The only ore concentrating pilot mill available to the Government was seen in operation. One of the features of the open-house program was a laboratory demonstration of gas and dust explosion.

Coal Producers Elect President

At a joint meeting of the boards of directors of the Central Pennsylvania Coal Producers' Association and of the Eastern Bituminous Coal Association, J. William Wetter, president, Rockhill Coal Co., was elected to the presidency of these organizations. T. F. McCarthy, vice-president, Clearfield Bituminous Coal Corp., was elected vice-president of the Central Pennsylvania Association and W. H. Naylor, vice-president, Davis Coal and Coke Co., was elected vice-president of the Eastern Bituminous Coal Association.

Mr. Wetter has long been associated with the bituminous coal mining industry and has served as a director of the Central Pennsylvania Association for nearly 30 years and of Eastern Bituminous Association since its organization in 1933. He also served under several governors as a member of the Pennsylvania Bituminous Mine Inspectors Examining Board, and in 1930 he became president of the Rockhill Coal Co.

Largest Ore Carrier

What will be the largest and most up-to-date ore carrier on the Great Lakes is now being built by Inland Steel Co. The new ship, to be called the "Wilfred Sykes" in honor of the company's president, will have a capacity of 20,000 gross tons. The vessel will be 678 ft long, 70 ft wide, and 37 ft deep, and will travel at 16 mph.

Dump Concentration Plant

The Charleston Iron Mining Co. is now constructing a new washing plant to concentrate a lean ore dump of 15,000,000 tons at the Charleston mine near Virginia, Minn.

Mill Operations Begun

Operation of the new 1200-ton capacity combination jig-flotation plant of the Eagle-Picher Mining & Smelting Co. has started. The plant is located near Galena, Ill. Ores will be treated from the Graham-Snyder lead-zinc mine which has been opened by two 300-ft shafts. Custom ores will also be handled.

All-Rail Iron Ore Shipment

During the past winter the Oliver Iron Mining Co. shipped iron ore all-rail to Birmingham, Ala. The ore shipped came from the Geneva mine near Ironwood, Mich., on the Gogebic iron range. The 1000-mile shipments were continued, from February 9 until the opening of the lake shipment season.

Electric Eye Aids Mill Operations

Eight Nordberg compound stamps in the Ahmeek mill of the Calumet & Hecla Consolidated Copper Co., in Michigan, are now being controlled by means of photo-electric eyes. These stamps were designed and built to operate with a stamp shaft stroke of about 24 in. Operation with a shorter stroke prevents stamping at full capacity, and wastes steam. Careful control of stroke was necessary as each stamp consumes about $100 worth of steam per day. Blinker lights are attached to the photo-electric eye as well as a counter which records each normal length stroke. A pen recording set shows the time distribution of all low strokes made on every shift. This information enables controlled operation of the stamps at full stroke to obtain maximum efficiency.

Central Mill Improvements

A 150-ft diam, center drive thickener of the Butchart spiral type has been installed at the central mill of the Eagle-Picher Mining and Smelting Co., Picher, Okla. The new thickener was designed and built by the Dagley Mfg. Co., of Joplin, Mo. The old 100-ft thickener will be reconditioned after re-routing the overflow.

In connection with this new installation a central pump house, housing 14 five-in. diaphram pumps, has been built. Eight pumps are connected to the 150-ft thickener of which six will be employed for normal use and two will be reserved as standby pumps. The other six pumps serve the 100-ft diam thickener. When the thickener is overloaded extra pumps are placed into action by means of a connection with the electric drive of the thickener. The overload is also controlled by an electrically driven raising and lowering device.

Shaft Mine Abandoned

The last shaft mine in the Brazil, Ind., area, the Rio Grande Coal Co.'s mine, is being abandoned and machinery and equipment is now being removed. Considerable coal acreage is retained in the area by the company which may later sink a new shaft or lease the property for strip mining.

Headframe Erection

Erecting crews of the McDowell Co., Inc., Cleveland, Ohio, were scheduled to arrive in April to begin building a new steel headframe to serve the new Mather "B" shaft at Negaunee, Mich., on the Marquette iron range. The new structure is designed for a height of 125 ft and will require a total of about 400 tons of structural steel.

Howard I. Young, retiring president, American Zinc Institute, chats with Edward H. Snyder, incoming president. The perpetual motion clock was a token of appreciation presented to Mr. Young by the membership of the Institute in recognition of his outstanding service as president, and previously as treasurer of the organization—spanning a total of 31 years since the founding of the Institute in 1918

American Zinc Institute

At the annual meeting of the board of directors of the American Zinc Institute, in St. Louis, Mo., Edward H. Snyder, president, Combined Metals Reduction Co., was elected president, succeeding Howard I. Young, president, American Zinc, Lead & Smelting Co., who held the office since 1935. The following new vice-presidents were also elected: Clarence Glass, Anaconda Sales Co.; George Mixter, U. S. Smelting Refining & Mining Co.; and Raymond F. Orr, Athletic Mining & Smelting Co.

Erle V. Daveler, vice-president, American Zinc, Lead & Smelting Co., was elected treasurer, and Ernest V. Gent was reelected executive vice-president and secretary. Directors elected for the term ending 1952 were: A. E. Bendelari, O. W. Bilharz, C. M. Chapin, Jr., M. L. Havey, W. B. Porter, S. H. Levison, R. G. Kenly, George Mixter, and R. F. Orr.

A series of outstanding papers pertaining to the zinc industry were presented on the program. Evan Just, director, Strategic Materials Division, ECA, discussed the influence of ECA expenditures on mining abroad. R. A. Young, vice-president, American Zinc Co. of Illinois, reviewed the increased costs of the smelting industry since

1939. Technical and economic changes facing the mining industry were pointed out by Julian W. Feiss, assistant to the director, U. S. Bureau of Mines. The outlook for zinc markets was considered by R. G. Kenly, manager, metal division, the New Jersey Zinc Sales Co. W. G. Patton, chairman, general traffic committee, American Zinc Institute and general traffic manager, St. Joseph Lead Co., discussed the effect of freight rates on zinc prices. Labor and supply costs in the lead-zinc industry since 1939 were reviewed by W. C. Page, assistant general manager, western operations, U. S. Smelting Refining and Mining Co.

Sessions held on the second day of the meeting were devoted to technical papers on practices employed in the utilization of zinc in the fabrication of consumer products.

Gallium from Bauxite

According to the annual report of the Aluminum Company of America, a process for the recovery of gallium from bauxite has been developed. Gallium, with its unusual properties, is deemed important to the development of power with atomic energy. Gallium is a liquid at 86 F but has a high boiling point.

Tri-State Activity

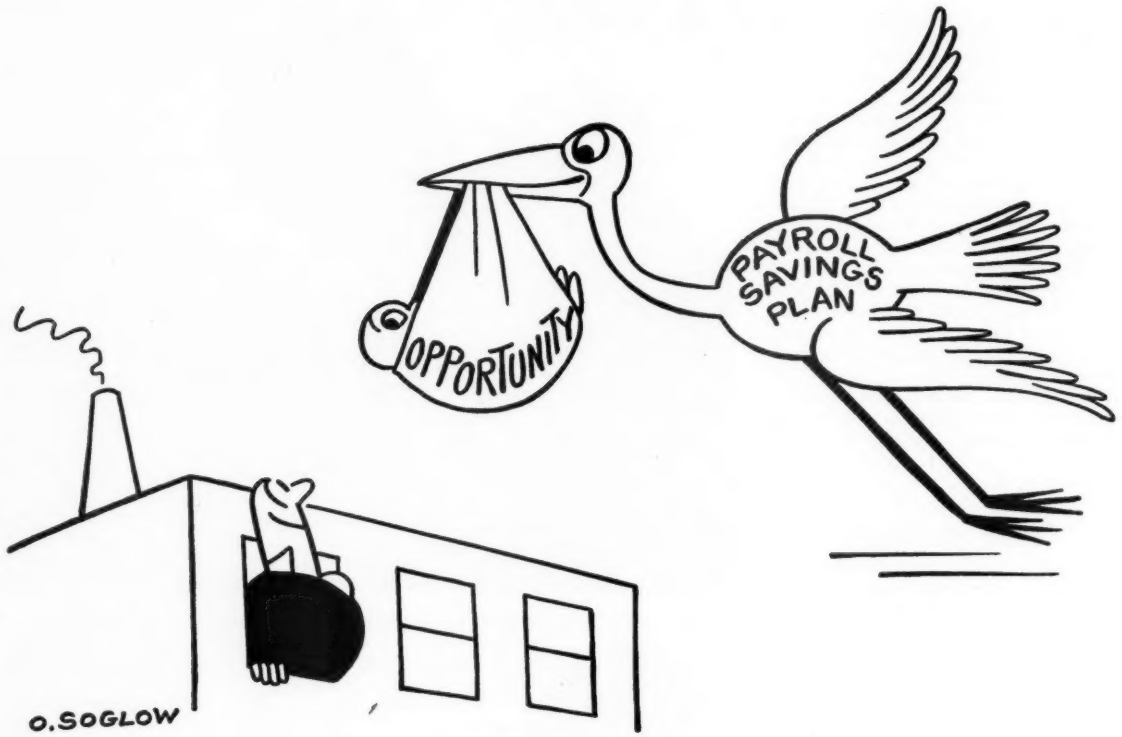
Near Joplin, Mo., the Rex Mining Co. is sinking a shaft in a lead ore body contacted by four drill holes. The new strike is located on the old Thousand-Acre tract. The Earnie Carr Mining Co., located on a ten-acre portion of the area, is producing ore. Young Bros. are sinking in another deposit located on the tract and Elmer Workman and associates are producing ore from a shallow shaft.

Barr Mine Fire

The Barr Coal Co. mine near Athens, Ill., may be sealed for three or four months except for intermittent testing. A fire in the mine provided the first test for the mobile mine rescue unit of the State Department of Mines and Minerals. The rescue unit was called at 11:45 am and arrived at the mine shaft at 12:30 pm. No men were in the shaft at the time of the fire.

Radioactive Mineral Search

According to Dr. A. K. Snelgrove, of the Michigan College of Mining and Technology, Houghton, Mich., two exploration parties will study radioactive deposits in Michigan's upper peninsula this summer. No commercial deposits have been found in this area but four areas have been described as holding possibilities of uranium occurrences.



Put more opportunity into your company's future

WITH THIS FIVE-STEP PROGRAM

Here's an easy-to-follow program that will substantially increase your company's chances for a prosperous future.

Nation-wide experience in 20,000 companies proves that this popular program also pays off handsomely *today*. It increases each participating employee's peace of mind—making him a more contented, more productive worker. It reduces absenteeism, lowers accident rates, increases output, and improves employee-employer relations!

This program is simply a proved formula for building membership in the Payroll Savings Plan—the "automatic" system by which millions of workers are investing in U. S. Savings Bonds every pay-day.

What Are the Five Steps?

The benefits of the Payroll Savings Plan to your company are in proportion to the percentage of employees who participate. Nation-wide experience indicates that 50% of your employees can be persuaded to join *without high-pressure selling*. Here are five steps which have proved to be the "magic formula" for putting over the Plan. They will get results for you:

1. See that a top management man sponsors the Plan.
2. Secure the help of the employee organizations in promoting it.
3. Adequately use posters and leaflets and run stories and editorials in company publications to inform employees of the Plan's benefits to them.
4. Make a person-to-person canvass, once a year, to sign up participants.

These first four steps should win you 40-60% participation. Normal employee turnover necessitates one more step:

5. Urge each new employee, at the time he is hired, to sign up.

Check up on the Payroll Savings Plan in your company. If fewer than half of your employees are participating, you have a lot to gain by following the five-step program outlined here. All the help you need is available from your State Director, U. S. Treasury Department, Savings Bond Division. While it's on your mind, why not call him right now? Or write the Treasury Department, Washington 25, D. C.

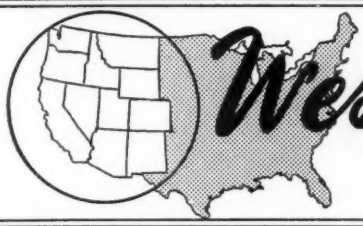
Are You With It?

In the current national Savings Bonds campaign, May 16-June 30, the Treasury Department asks each company operating the Payroll Savings Plan to canvass all employees, with the goal of having at least half of them signed up by the end of the month. This advertisement tells how you can achieve that goal most easily.

The Treasury Department acknowledges with appreciation the publication of this message by

MINING CONGRESS JOURNAL

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council.



Western States

Bonanza Development Plans

A $300,000 development program is being planned by the Bonanza Mining Co. for its copper property seven miles northwest of Wenden, Ariz. This company was organized last October by a group of residents of Superior, Ariz., most of whom are employes of Magma Copper Co.

Results of diamond drilling during the winter were encouraging and a full-scale development program was started. A depth of 280 ft has been attained in the proposed 300-ft shaft, and it is planned to start ore production from a drift on the 300-ft level.

Roy R. MacDonald, Wenden, Ariz., is president and general manager of the company. Robert Burns, level boss at Magma's Superior mine, is vice-president.

Calera Plans Camp

The Calera Mining Co., a subsidiary of Howe Sound, has ordered 500,000 bfm of lumber for the construction of a mining camp in the Blackbird district in Lemhi County, where the company is developing the largest known cobalt property in the United States. The company recently awarded a contract for the construction of a high tension electric power line from Armstead, Mont., to the mine.

Coal Mining Engineering

The first announcement of a course in coal mining engineering was made in the 1949-50 catalog of the Colorado School of Mines, Golden, Colo. Prof. Albert M. Keenan is in charge of the new course.

Long Tunnel Project

Providing present government plans materialize, Idaho will have the longest tunnel in the world, a bore 30 miles long, 19 ft in diameter, at an estimated cost of $100,000,000. The project is designed to carry water from the Payette and Boise Rivers into the Boise basin and the 192,000-acre Mountain Home irrigation development. R. J. Newell, regional head of the Reclamation Bureau, estimates it would take six to eight years to complete the job with 1000 to 1500 men employed. The tunnel would pass directly under the famous old gold mining camps of Quartzburg and Placerville. It would have a maximum depth of 2500 ft and would deliver 2700 cu ft of water per second.

Ermont Mines Sold

The properties of Ermont Mines, Inc., have been sold under a bond and lease arrangement to the Olamont Mining Co., which also operates a gold property south of Silver Bow Creek in the Butte district. The Ermont property is equipped with a large surface plant, mining equipment, and a 100-ton counter-current cyanidation plant. Once a profitable gold operation, the property has not been operated since 1942.

East Utah Stops Tunnel

The East Utah Mining Co. is discontinuing operations in its mine in the East Park City, Utah, district. The tunnel has been driven to a point about 5500 ft from the portal. The joint operation by the New Park Mining Co. and the Newmont Mining Corp., known as the General Connor Mining Co., will continue work from the East Utah tunnel to explore the Homestake fissure area.

High Grade Developed

Silver Syndicate Mining Co. has now opened its vein system on the 3100 level, showing a 4 ft width of high grade silver-lead ore. All previous development has been on the 3700 level, where the company has opened an ore shoot of commercial grade and width for a distance of around 500 ft. The company plans a production of 1000 tons per month.

Communications Tests

E. W. Felegy, mining engineer of the U. S. Bureau of Mines, Safety Branch, Salt Lake City, Utah, is in Arizona to continue experiments started in 1946 to adapt radio communication underground. He will conduct experiments at several of the large copper mines to test the five-watt, battery-operated portable transmitter-receiver he designed, based upon his Navy training and mining experience. It is the first time such an attempt has been made in the state and Felegy will make no predictions as to results since many unpredictable factors are involved in radio communication underground.

A low-frequency, long wave length is employed. The range, so far, is quite limited as propagation of radio waves through the medium of solid rock is quite a different problem from the ordinary radio communication. The Bureau engineers state that if the equipment can be adapted, radio communication may be useful in rescue work for emergencies following a mine disaster when telephone lines are usually damaged. Radio communication is being used effectively on trolley locomotives in connection with underground haulage in some large coal mines.

Copper-Zinc Mine Reopened

In late 1948, reopening of the Copper Hill mine in Amador County, Calif., was begun. The mine had been previously worked for two periods of six years each during which a series of six or more shafts were sunk and considerable development undertaken. Development completed during a period of operation in World War II indicated economic possibilities which are now being investigated.

Ajo Work Pushed

The Ajo smelter of Phelps Dodge Corp. should be completed and in operation before the end of 1950, stated Robert G. Page, president, during a recent visit to Arizona. He reported that work on the $11,000,000 project is being pushed as rapidly as possible, and that site preparation, and other preparatory work have been completed. The extension to the power plant at Ajo, to provide additional power, is expected to be completed in mid-1949.

During 1948, the average daily tonnage moved from the Ajo pit was 44,784 tons, of which 25,272 tons were ore and 19,512 tons waste, or a ratio of waste to ore of 0.77. Ore and waste was moved from the pit in trains hauled by trolley-electric locomotives with Diesel auxiliaries. Loading is by electric shovels.

Antimony Research

In cooperation with the University of Idaho State School of Mines in a special research program, antimony producers are working on a method to produce white antimony oxide from pig antimony produced from the smelting of stibnite ores from the Yellow Pine mine. It is expected that the new smelter, now under construction by Bradley Bros. at Stibnite, Idaho, will have an annual production of 5000-6000 tons of antimony. The plant will employ about 50 men and will save gold and silver values in addition to antimony.

Wheels of Government

(*Continued from page* 47)

Meanwhile, coal operators have been advised by legal counsel that they are not required to bargain with the mine workers on welfare and pension funds because UMWA has not filed the non-Communist affidavits in compliance with the law. This position was sustained in the recent Supreme Court refusal to review the Inland Steel Co. case, in which a Circuit Court had upheld an NLRBoard ruling that union officials must file the affidavit before the Board could compel bargaining on pensions.

The Southern Coal Producers' Association on April 21 notified the UMWA of its intention to terminate the present contract on June 30, stating that "this notice does not in any way preclude our association with other groups or their association with us, or of separate negotiations, in order to obtain a new contract." The UMWA has now notified the Southern Association that its representatives will meet with them on June 6 at Bluefield, W. Va., to negotiate.

Ray Stripping Proceeds

Kennecott Copper Corp., Ray Mines, Ray, Ariz., reports that good progress is being made in stripping the ore body which is to be mined by open-pit methods. The work is proceeding on a three-shift basis with 165 men employed. It is expected that some ore from the pit will be available during the second half of the current year, but in all probability it will be the latter part of 1950 before operation can be brought up to the planned capacity production of 9,000,000 or more pounds of copper monthly.

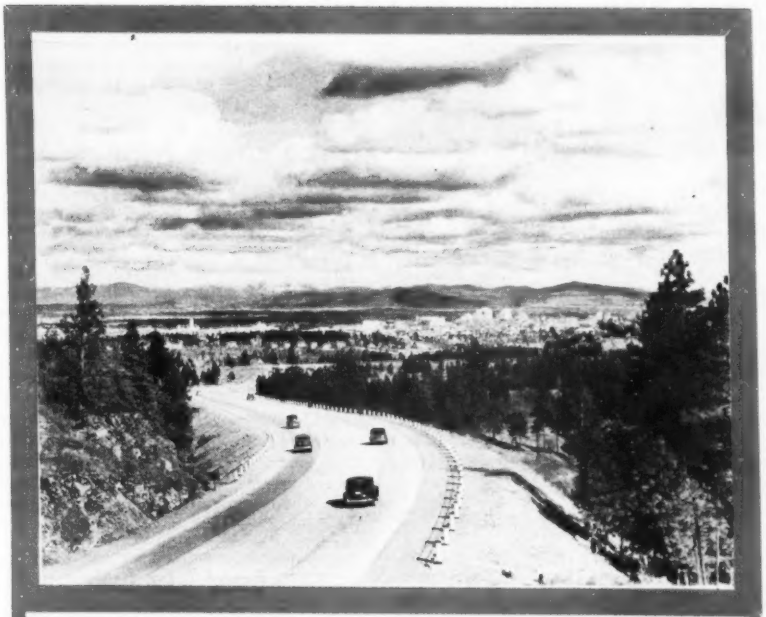
In preparation for the mining of increased tonnages, a 10,000-kw turbo generator is being added to the power plant, an extension made to the crushing plant at the mine, and additional grinding units will be installed in the mill. Present production at Ray is small due, it is said, to the continued shortage of underground miners.

Idaho Mining Meet

The Idaho Mining Association will again hold its annual convention at Sun Valley, Idaho. The meeting will take place June 13-15. J. B. Haffner, general manager, Bunker Hill & Sullivan Mining & Concentrating Co., is president of the association. Reservations for this meeting should be made now through Harry W. Marsh, secretary, Idaho Mining Association, 304 Baird Building, Boise, Idaho.

Anaconda's Great Falls Expansion

Operations of the Anaconda Copper Mining Co.'s plant in Great Falls, Mont., will be expanded by the construction of $1,800,000 in additional facilities, it was recently announced by R. B. Caples, manager. The improvement program is expected to be completed by July 1, 1950. Included under the project are the installation of a copper billet casting plant and the addition of another complete unit to the zinc processing department. The Great Falls plant now has eight such units and is the largest in the world. Production of copper billets will add a new department to the refinery. An entirely separate casting set-up will be required. Billets will be shipped to the American Brass plant at Kenosha, Wis., for fabrication into copper pipe and tubing. New construction authorized in Great Falls, including the new $200,000 employes club, totals $2,000,000. The expansion will require the addition of at least 100 men to the smelter payroll of 2000 men. Pointing to the magnitude of the operations of the zinc plant, Mr. Caples said about 2,000,000 lb of concentrates are processed every month in Great Falls, with ore being received from New Mexico, Arizona, California, Nevada, Idaho, Washington, and Montana.



★ On the Road to Spokane ★

1949 Metal Mining Convention Plans Take Shape

WITH a bin-full of valuable suggestions already on hand, State Chairmen of the Program Committee of 1949 Metal Mining Convention plan to meet at the Hotel Davenport, Spokane, early in June. At that time the bin will be tapped and milled to extract those topics of maximum value to the majority of metal and nonmetallic mining men.

Over-all plans for an outstanding 1949 meeting to be held in Spokane, September 25-28, are shaping up under the direction of Stanly A. Easton, president, Bunker Hill and Sullivan Mining and Concentrating Co., and Chairman of the Western Division of the American Mining Congress. William J. Coulter, general manager, Climax Molybdenum Co., and National Chairman of the Program Committee, will preside at the June meeting of the State Chairmen, which will be devoted to drawing up a program covering legislative and economic problems of mining, together with a comprehensive treatment of mining and milling developments of the deepest interest to operating men.

Further suggestions as to topics and speakers will be welcomed by the Program Committee. Forward yours to the American Mining Congress, 1102 Ring Building, Washington 6, D. C.

The General Arrangements Committees, headed by R. M. Hardy, president, Sunshine Mining Co., together with Vice-Chairman Roger O. Oscarson, secretary, Northwest Mining Association, are forging ahead with preparations for an active convention week.

Wray Farmin, director, Day Mines, Inc., and Chairman of the Trips Committee is working out a schedule of visits to a number of the many important mining operations in the Inland Empire, and in the Coeur d'Alene and Metaline Districts. James A. Ford, managing secretary, Spokane Chamber of Commerce, Chairman of the Publicity Committee, is marshalling facilities for "spreading the word" and newspapers and radio stations in the Northwest are giving splendid cooperation. Mr. R. P. Porter, as Chairman of the Ladies Committee, has lined up some especially fine activities, including entertainment and trips, which the ladies will surely enjoy.

Make your hotel reservations through the Housing Committee, American Mining Congress Convention, Hotel Davenport, Spokane. Now is the time to set your course and plan to get on the road to Spokane.

Nivloc Development

Arrangements are being completed by Nivloc Mines for production of silver-gold-lead ore from its Nivloc property, west of Silver Peak near Goldfield, Nev. A hoist at the surface will be installed on a winze from the 700-ft level, a more powerful hoisting plant will be placed near the main shaft, and mining will be done to a depth of 1100 ft. Recent development work is said to have disclosed a new vein 3-4 ft wide, assaying $30 a ton. The management plans to ship the richer ore to a smelter, and some of the product will be trucked to the Newmont mill at Goldfield, which is ready to receive custom ore. A mill capable of handling 75 tons daily may be later constructed. Electric power is furnished by a Diesel generating plant.

Uranium Hunt in Utah

Prospectors are working 50 claims in southeastern Utah in hopes of finding uranium. The search is centering in White Canyon in San Juan county. The Vanadium Corporation of America is constructing a pilot mill across the Colorado river from Hite and operations are expected to begin shortly. The mill will be equipped to process ore having as little as 1/20th of one percent uranium. Initial operations call for processing 40 tons of ore daily. Capacity will be expanded to 200 tons per day if operations prove successful.

Uranium Processing

In a recent announcement the U. S. Atomic Energy Commission stated that a contract had been signed with the U. S. Vanadium Corp. for rehabilitation and operation of that company's uranium-vanadium processing plant at Uravan, Colo. The plant is expected to be ready for operation about the end of 1949.

Part of the ore supply for Uravan will come from mining properties in the Calamity, Colo., area which were acquired by the Government during the war. Ore will also come from mines of the U. S. Vanadium Corp. and through purchases from other producers.

Grand Teton Coal

The Grand Teton coal field near Driggs, Idaho, is being developed by J. B. Williamson and associates of Turtle Creek, Pa., who last year expended $300,000 in preliminary development work. Williamson has organized the Idaho Coal Co., which has a long term lease on the property on a basis of 15¢ per ton for all deep coal mined and 25¢ per ton for strip coal, with a minimum royalty of $18,000 per year. Williamson expects to start production in the near future at the rate of 500 tons daily. There are said to be 13 coal outcrops in the field under lease, ranging in width from 3 to 36 ft in thickness. The field embraces 1000 patented mining claims and has an estimated 100,000,000 tons of marketable coal. The Idaho state inspector of mines says the field is also believed to be potential oil territory.

Nevada Dredge Plans

Round Mountain Gold Dredging Corp. of California reports that construction of a plant is proceeding for operation of its gold placers in the Round Mountain district of Nevada. The corporation controls the extensive Round Mountain properties, formerly operated on a substantial scale by Nevada Porphyry Gold Mines. Placer mining will be conducted with power shovels, and the product will be delivered by conveyors to a large capacity washing plant. Production is expected to start before the end of 1949.

Gladstone Mt. Ore Chimney

Gladstone Mountain Mining Co., one of the pioneer producers from the "chimney" lead ore deposits in Stevens County, Wash., has discovered a new chimney of high grade lead ore as a result of bulldozer operations in new territory. The "chimneys" are peculiar in that they are in limestone, have no connections with one another and do not occur according to any definite plan and are in a limited area. The ore occurs loose in carbonate and sulphide form.

Hilarity Tunnel

The tunnel being driven by New Hilarity Mining Co. at the head of Elk creek, east of Kellog, Idaho, has now passed the 3000-ft mark, and has about 300 ft to go to reach the site of a proposed shaft station, according to Gene Iverson, engineer in charge.

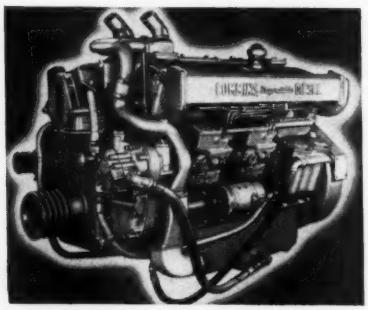
Manufacturers Forum

Mobile Safety

Mine Safety Appliances Co. recently announced its mobile safety station, one of the most effective means of bringing employes the latest in safety practices, with complete equipment for demonstrations and training. These well-equipped truck-mounted units are now in service in Pennsylvania, Illinois, Kentucky, and Quebec as safety and training centers equipped for mine rescue, dust control, gas analysis, first aid, and instruction. The mobile safety station can be supplied and built to the requirements of the purchaser.

Powerful Highspeed Diesel

A new Model NVHS-1200 Diesel announced recently by the Cummins Engine Co. of Columbus, Ind., is



claimed to furnish more power than any high speed Diesel now in production. This newest four-cycle, 12-cylinder, V-type, supercharged engine has a maximum rating of 550 hp turning at 2100 rpm.

Tested and proved in the Cummins laboratories, the new engine has also been field tested in off-highway haulage trucks (payloads of 30 and 40 tons), in a 5-yd shovel, and in 65-ton locomotives.

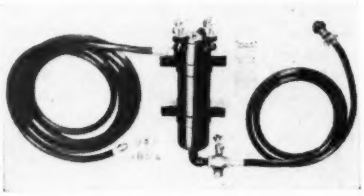
With its companion Model NVH-1200, a naturally aspirated four-cycle, 12-cylinder, V-type Diesel having a maximum rating of 400 hp turning at 2100 rpm, these latest engines provide operators of automotive off-highway and industrial equipment with all the advantages of high speed Diesels in the higher horsepower range.

Along with increased horsepower, high operating engine speed, and portability, the new Cummins Models NVHS-1200 and NVH-1200 offer operators fuel economy as well as reduced over-all engine dimensions. These new engines are equipped with a completely new fuel pump, a refinement of the distinctive Cummins fuel system.

At a press preview, representatives from trade magazines and daily papers were present. In addition to seeing the new addition to the company's line of Diesel engines, guests were taken on a tour of Cummins production and experimental departments.

Dustless Coal

For preparing dustless coal without measuring or mixing the dedust-

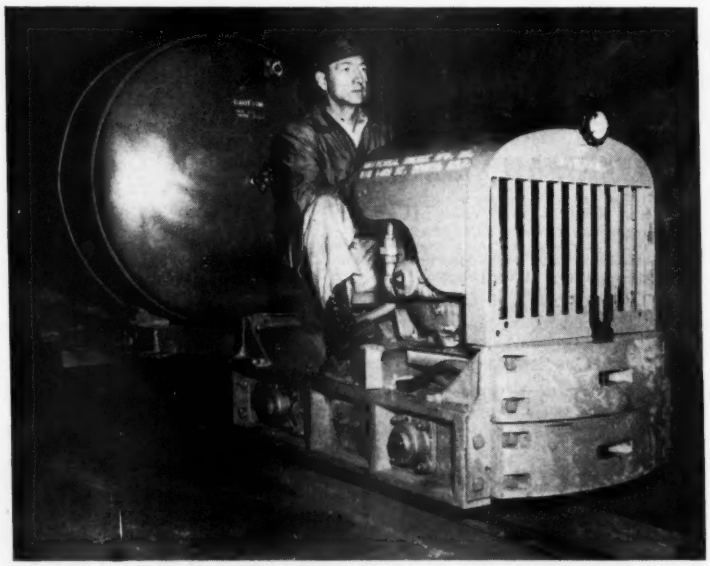


ing solution, The Johnson-March Corp., Philadelphia, Pa., devised a unit

Air Trammer

The Universal Dredge Manufacturing Co., Denver, Colo., now has in operation in several mines air trammers that work on the normal 100 lb pressure used for other mine air tools. Of simple design, the "Tramaire" is equipped with either 4½-hp, 6-hp, or 10-hp motors with either a 30- or 36-in. diam air storage receiver. For longer hauls and heavy loads the "Tramaster" is equipped with a 6-hp, 10-hp, or 15-hp motor and a 42- or 48-in. diam receiver. The variety of sizes is produced in order to suit varying haulage conditions. Distances in excess of 1200 ft on level track are possible with "Tramaire" and as much as 3000 ft with the "Tramaster." Maximum speed of the unit is 5 mph.

Low maintenance cost is claimed for this unit which is said to be able to move one ton of ore one ft with $\frac{1}{30}$ cu ft of air under average conditions.



Trammer operates on normal mine air pressure

known as the automatic flow proportioner which automatically dissolves Compound M, in water in the proportion required to wet the coal sufficiently to allay dust. The proportioner comes completely equipped with hose, nozzle, and clamps for installation. No motor or pump is required.

Bolt Cutter

Manco Manufacturing Co., Bradley, Ill., has designed a new special center cut bolt cutter with chisel type jaws of forged tool steel for cutting case-hardened bolts, chain, reinforcing rod, and other hard materials. A variety of sizes are available with capacities up to 7/16 in. solid rod.

Belt Conveyor Carrier

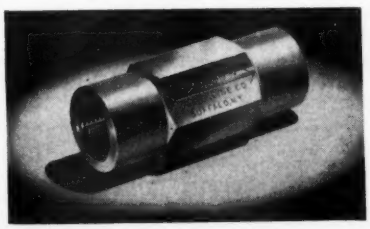
The Stephens-Adamson Mfg. Co., Aurora, Ill., has announced a new belt conveyor carrier equipped with permanently-sealed, self-aligning, prelubricated Sealmaster ball-bearing units. The one piece, welded steel frame, which is designed to tilt in the direction of the belt travel and keep belt centered without need for guide rollers is featured. An inverted angle base and specially designed end bracket are said to shed material and keep rollers free.

Light-Duty Screen

The Screen Equipment Co., Inc., Buffalo, N. Y., has announced production of a new line of light-duty vibrating screens known as the Mighty-Mite. They are designed to simplify a number of small screening jobs often performed by hand in many industrial plants. Single and double-deck models are available in several sizes.

Automatic Shutoff

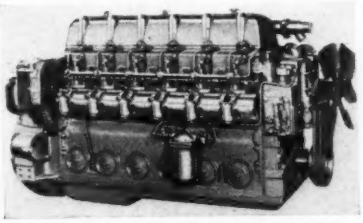
An automatic safety shutoff valve for use on compressed air lines is being produced by the Olin Gas Engine Co., Buffalo, N. Y. The valve is made to fit standard connections and is inserted at the intake end of the air



hose. When a break occurs in the hose, the valve closes and shuts off the pressure, permitting only a light stream of air to escape through a by-pass. When the repair is made the pressure will equalize and the valve opens automatically. Tools may be changed without shutting off valve at the air line.

Lightweight Diesel

Extensive research has resulted in the development by the Harnischfeger Corp. of the P & H Diesel power unit, a 2-cycle engine said to combine the advantages of medium and high



crankshaft speeds, satisfactory piston speeds, and an over-all lighter weight unit in comparison to present 2-cycle solid injection supercharged Diesel engines. Each cylinder of the unit is an independent, fully water-jacketed assembled unit which is said to provide a savings in time when maintenance is required.

Tire Repair

A new method of repairing injuries to off-the-road tires is recommended by Goodyear Tire & Rubber Co. Injuries not extending too deeply into the tire may be repaired without re-

moving the tire from the vehicle by use of a light, portable hot air blower or vulcanizer, that vulcanizes a special rubber into the injury without physical pressure. Known as the Schlegel air-welder, the 17-lb device cures without pressure and may be used anywhere that electric current is available. A special rubber used in the vulcanizing process is termed Air-Weld rubber, made exclusively for Schlegel by Goodyear. Both the air-welder and the rubber may be purchased from R. E. Schlegel, Inc., Akron, Ohio.

Medium-Weight Rock Drill

A new, medium-weight jackhammer has been introduced by Ingersoll-Rand Co. Known as the J-40, the machine is similar in design as the heavier J-50 model and contains many of its features. This new jackhammer was designed with Carset jack bits in mind and is especially suited for use with these units. A three-in-one backhead enables the machine to be adjusted for wet, dry, or blower-type drilling.

CATALOGS AND BULLETINS

AUTOMOTIVE DIESELS. *Mack Trucks, Inc., Empire State Bldg., New York City.* An illustrated catalog describes the newly designed 4-cycle, 6-cylinder, 150 hp Diesel engine. Drawings and photographs present the advantages of automatic timing, controlled combustion, and controlled fuel distribution. A companion piece to this catalog is a booklet entitled "Understanding the Automotive Diesel." Prepared in a non-technical manner, this 67-page booklet presents a brief history of the Diesel engine and compares it with other types of engines. Diesel fuel, combustion systems, starting and stopping, controls, and economy are considered. Copies of both publications may be obtained upon request.

BATTERY TECHNOLOGY. *The Gould Storage Battery Corp., Trenton 7, N. J.* A handbook on battery technology is offered which contains detailed information on the care and operation, maintenance and repair, parts, and technical data pertaining to storage batteries. Copies of this 40-page pocket-size handbook may be obtained free upon request.

BOTTOM-DUMP HAULER. *The Euclid Road Machinery Co., Cleveland 17, Ohio.* Upon direct request, copies of a recently published catalog folder describing the 40-ton, bottom-dump coal hauler that is the latest addition to the Euclid line of self-powered hauling equipment may be obtained. This high capacity unit is being utilized on many large strip mining operations throughout the country. It is powered with a 275 hp Diesel engine, has a top speed of 31.2 mph with an 80,000 lb payload.

CAGES AND SKIPS. *Vulcan Iron Works, Wilkes-Barre, Pa.* A bulletin describing the principal types of cages, skips, and gunboats produced by the company includes information on six recent Vulcan electric hoists designed to meet specific requirements. Sheaves and slope rollers are also catalogued.

JAW CRUSHERS. *The Pennsylvania Crusher Co., Philadelphia 7, Pa.* In a new bulletin on Kue-Ken jaw crushers, advancements made in jaw crusher design in recent years are outlined. Design features of Kue-Ken crushers which feature "crushing without rubbing" are described.

MINE JACKS. *The Duff-Norton Mfg. Co., Pittsburgh, Pa.* A handy guide for mine jacks is offered which illustrates the various types of mine timbering and roof jacks and fittings, pin timbering and angle jacks, push and pull jacks, bell base jacks, automatic lowering jacks, pinion pullers, low height jacks, and "hy-power" hydraulic jacks produced by the company. The new bulletin called "Handy Guide for Selecting Duff-Norton Mine Jacks" may be obtained upon request.

POWER DISTRIBUTION. *Westinghouse Electric Corp., East Pittsburgh, Pa.* A 35-page brochure emphasizes the importance of a reliable and safe power distribution system and outlines requirements and why these points are essential. Entitled "Electric Power Distribution for Open-Pit Mines and Quarries" this well-illustrated booklet explains in detail the features of a reliable distribution system and how to achieve them.

— Index To Advertisers —

Service-proved Efficiency and Utility for every required application—

MODERN MINE RESCUE EQUIPMENT *by* M·S·A

M·S·A TWO-HOUR OXYGEN BREATHING APPARATUS

The famous M.S.A. McCaa two-hour apparatus, recognized standard of the mining industry, supplies complete respiratory protection to the wearer in unbreathable atmospheres for a minimum of two hours, under hard physical exertion. Approved by the U. S. Bureau of Mines, the Two-Hour Apparatus employs a high-pressure oxygen cylinder, and a regenerator which purifies expired breath by removing carbon dioxide, returning the oxygen content to the circulating system. The Apparatus is the cornerstone of many protection and rescue programs. Write for Bulletin BB-3.

M·S·A SELF-RESCUER

A miniature gas mask, U. S. Bureau of Mines-approved, belt carried, hermetically sealed until used. This handy, popular equipment protects user against carbon monoxide after fire or explosion for at least 30 minutes. Bulletin EC-74.

H-H INHALATOR

Used in conjunction with artificial respiration, the H-H Inhalator speeds effectively the work of resuscitation by supplying correct oxygen-carbon dioxide mixture to the patient's lungs according to demand—gently, naturally, safely. The Instrument is officially accepted by the Council on Physical Medicine of the American Medical Association, approved by the American Gas Association and the Association of Police and Fire Surgeons. Write for descriptive Bulletin CA-9.

M·S·A Chemox OXYGEN BREATHING APPARATUS

Making its own oxygen with a single, replaceable canister as the wearer breathes, Chemox provides a minimum of 45 minutes' respiratory protection in unbreathable air, and is officially approved by the U.S. Bureau of Mines. Simple to use—Chemox supplements other oxygen breathing apparatus types, can be stored underground—and is always ready for immediate use. Bulletin B-14.

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Light in weight, comfortable to wear, U. S. Bureau of Mines-approved. Provides protection against gases (including carbon monoxide), fumes, smokes, wherever sufficient oxygen is present in air to support life. Long-lived All-Service canister is quickly replaceable when required—All-Vision facepiece can be put on and adjusted rapidly—sturdy harness contributes to wearing ease. Bulletin EA-8.

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